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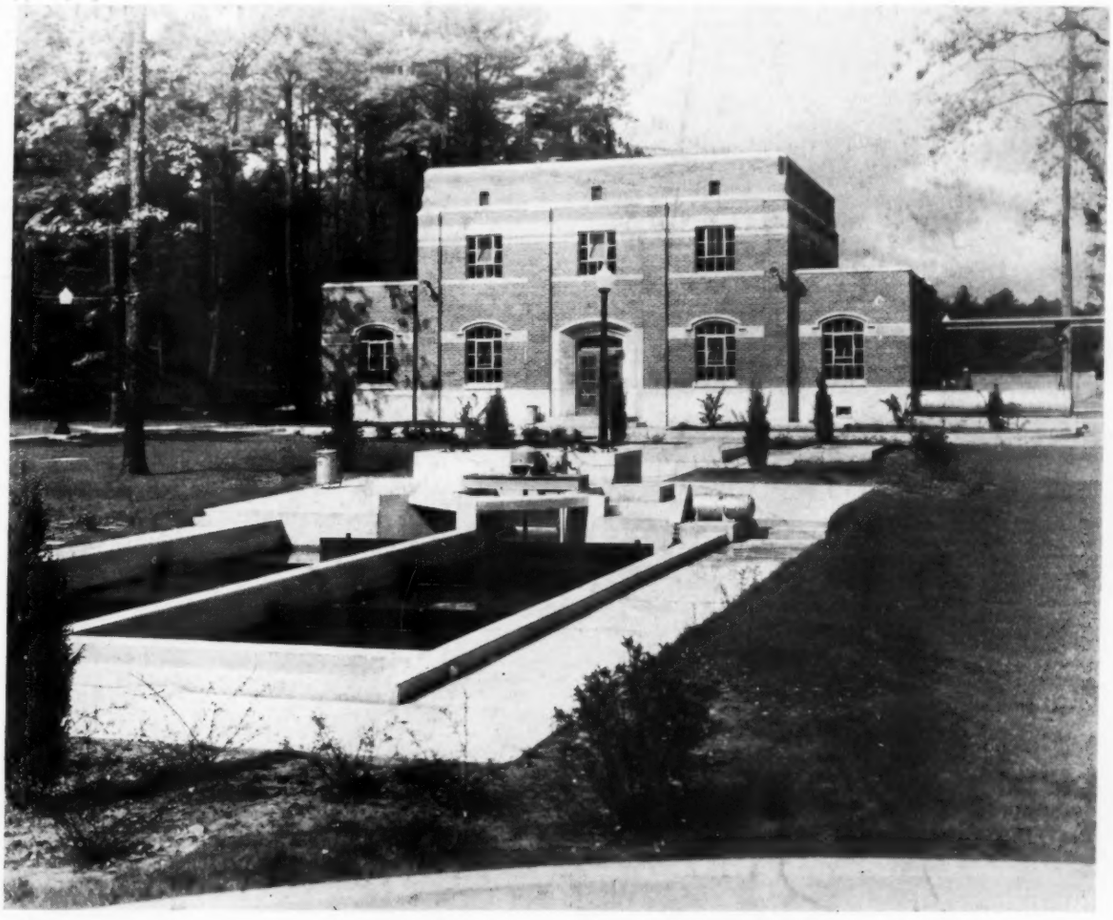
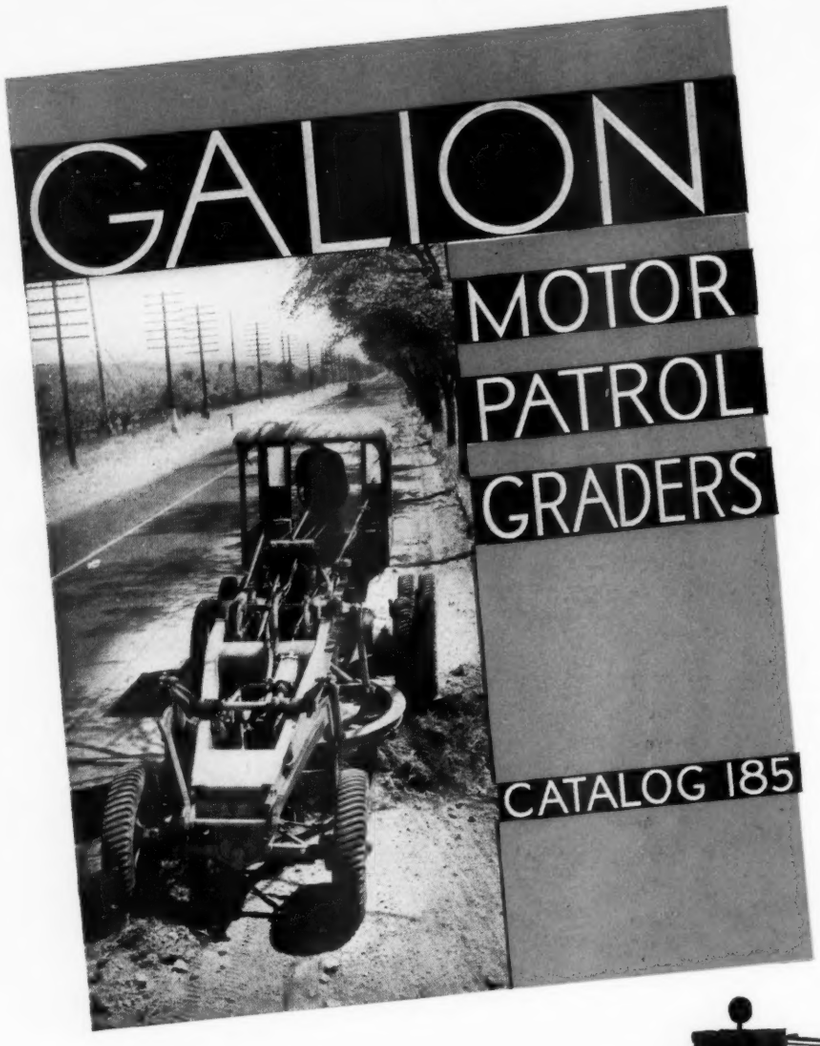
# PUBLIC WORKS

*City, County and State*



A view of the office building and part of the plant—Shades Valley, Birmingham, Alabama

FEBRUARY, 1935

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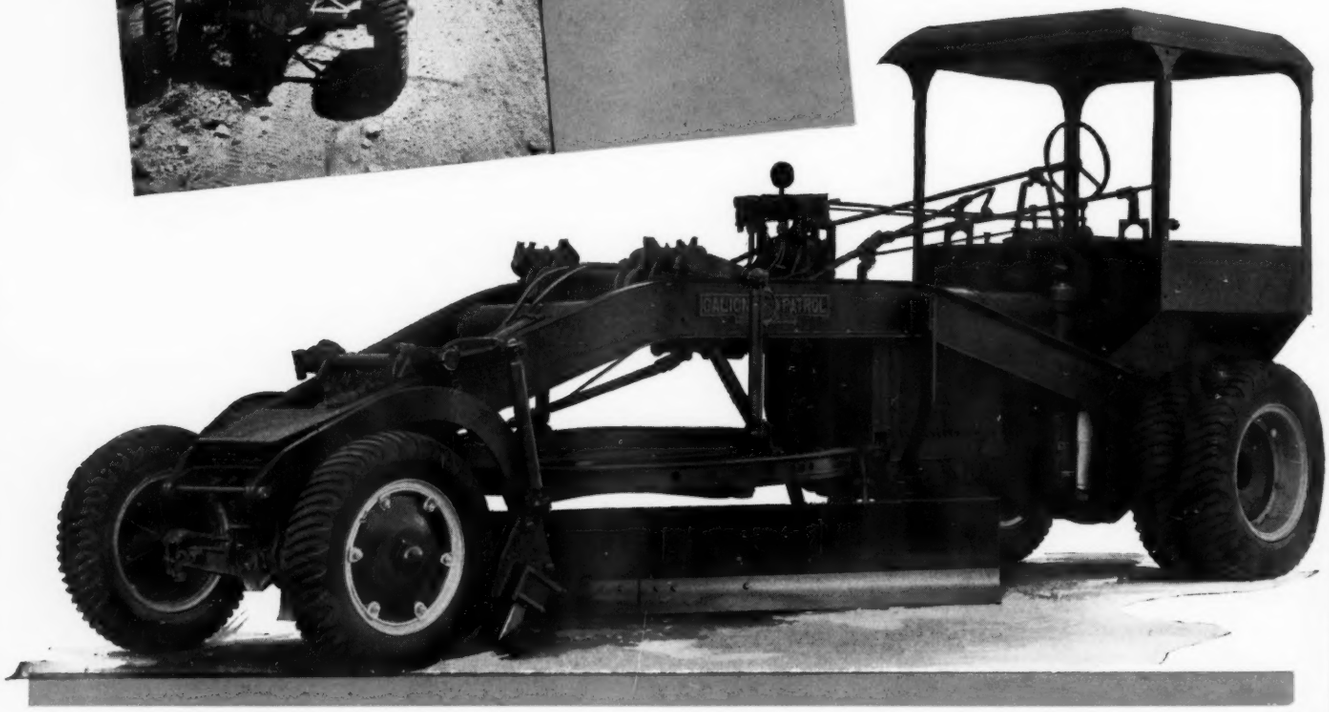

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FEBRUARY, 1935

*February 1935*

# PUBLIC WORKS

*Vol. 66 No. 2*

CITY, COUNTY AND STATE ENGINEERING AND CONSTRUCTION

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## TIMEWASTERS

**We Are Ashamed:**

After looking over the sad attempts of several engineers to figure out who is the smallest man mentioned in the Bible, we went to church ourselves last Sunday and as a result got invited to a place on the official board. No, we didn't accept. But to get back to the problem, it isn't Adam, as one of the New England semi-puritans tried to make us believe; nor is it *Nehimiah*; nor even Bildad the *Shubite*. The gentleman in question was the Roman soldier who slept on his *watch*. Put that in your Lefax.

**Attention Mr. Houtman:**

The little series stated by Mr. Houtman in our last issue has been proven by a number of earnest and thorough workers, and it still being too much for us, and the printers being about to strike rather than set up all the heavy equations resulting therefrom, we have transferred the correspondence to Mr. G. D. Houtman, whose address is Media, Pa., and all inquiries, arguments, slide rule salesmen, etc., are hereby referred to him.

**A Hard Times Problem:**

Three tramps met in last week's heavy snow storm. One had three loaves of bread; another had two loaves of bread; the third one had 45 cents cash money. After jointly devouring the bread, the tramp with the 45 cents distributed it in proper proportion for the bread he ate. If all ate the same amount of bread, how was the money divided? *A. E. Stilson.*

**Come On Sharks:**

What is the least number of cards necessary to form any number from 1 to 9999, if each card has one figure on the front and one figure on the back, and the figure 6 may be used for the figure 9 by placing the card upside down? *Benjamin Eisner.*

**Picking the Winners:**

Fifteen matches (or gold coins, or what have you) are laid out in a row, and two players alternate in withdrawing one, two or three consecutive matches or coins, as he sees fit, until all are removed; the object of each player being to make his opponent take the last one. How can the first player do this? How can the other one? *A. P. Folwell.*

Had a nice solution from Mr. Whitfield of Virginia on a problem appearing sometime back, but he sent it to our Chicago office. You can reach me best at New York, Mr. W. And who knows where a TIMEWASTER fan who is a doggone good city engineer can find a connection? The "Ins" are out and the "Outs" in, and a good man has to find something else to do. Suggestions will be forwarded promptly. Thank you. *W. A. H.*

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**A. PRESCOTT FOLWELL,** *Editor* **W. A. HARDENBERGH,** *Asso. Editor*

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*Reg. U. S. Pat. Off.

# 'INCOR' 24-Hour Cement

# PUBLIC WORKS

*City, County and State Engineering and Construction*

Vol. 66 — *February, 1935* — No. 2

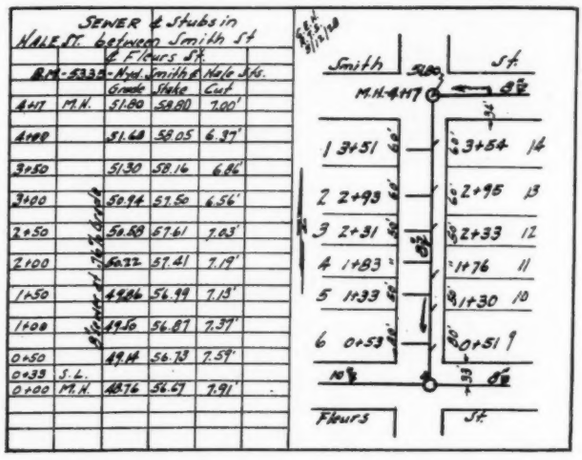




Fig. 1—Left and right sheets of a typical field book

# A Method of Keeping Records of a Municipal Engineering Office


By C. E. Hogeboom

*City Clerk and Assistant Engineer, Wheaton, Ill.*


ALL the information collected by the office of a municipal engineer should be available at a moment's notice. The importance of good up-to-date maps and proper records cannot be stressed enough. Too often, especially in times of decreased revenue, appropriations for the engineer's office are cut down, with the result that help is not available for classifying and filing the records but they are simply thrown into a pile, and when occasion arises for referring to some record it cannot be found without digging through a disorderly mass of blue prints, field books, correspondence, etc.; often with a consumption of time greater than would have been required for filing all the records in the office.

A filing system is described herein which has partially been installed in the engineer's office of a city of approximately 7,500 population. This city has an area of approximately 4.5 square miles, 22 miles of unpaved streets, 59.7 miles of paved streets, 111 miles of storm and sanitary sewers, 90 miles of sidewalk, and 62 miles of watermains with 540 water valves and 554 hydrants; not including several hundred sewer, drain and water laterals, etc.

Approximately 95 percent of the improvements in this city were installed by the special assessment method, and to date there have been approximately 388 such assessments, consisting of sewers, drains, watermains, sidewalks, street openings, pavement, laterals, etc. All data pertaining to each individual assessment are kept in a legal-size folder, the folder tab is numbered with its respective improvement number and all folders are kept in a legal-size file cabinet in numerical order. Besides having the number of the improvement on the tab, there is also written thereon a general description of the improvement; for example: "275—Paving—Main, Hale and Wesley Streets." Written on the outside of the folder is a number indicating the number of the field book where field notes pertaining to the job can be found.

All proposed and completed improvements by other than the special assessment method are filed in legal-sized folders in alphabetical order, and the drawer or drawers in which jobs are filed are identified by number.

All field books are kept and filed, being numbered in series. Grades, elevations, ties, bench marks, cuts, fills, etc., are all kept intact, enabling the engineer to give immediate information concerning any improvement ever installed. The illustration showing the inside of a field book indicates how notes are kept.

To simplify and expedite the locating of data pertaining to improvements in streets, a system is worked out with a file of 3" x 5" unruled cards (larger size cards can be used if necessary) of all streets within the city and arranged in alphabetical order. A card for every two blocks of a street is advisable in this case. Printed on this card are such data as are necessary to indicate the im-

```
WHEATON AVENUE between Wesley and Union

Paving- L. I.#173- Field Book #93
Sewer-  L. I. #113-  "     "   #16
Water Main-L. I.#153-"     "   #89
Sewer Stubs- L. I.#173 Field Book #93
Water Services- Drawer #3- Field Book #6
```

Fig. 2—Specimen of filing card

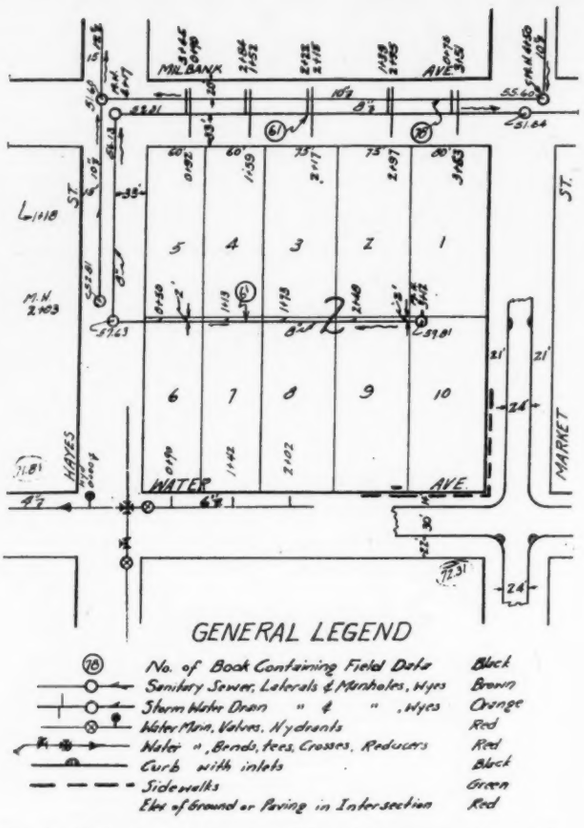

MILBANK
AVE
ST.
MARKET
HAYES
WATER
AVE
GENERAL LEGEND
No. of Book Containing Field Data — Black
Sanitary Sewer, Laterals & Manholes, Wyes — Brown
Storm Water Drain " & " , Wyes — Orange
Water Main, Valves, Hydrants — Red
Water " , Bends, tees, Crosses, Reducers — Red
Curb with inlets — Black
Sidewalks — Green
Elev. of Ground or Paving in Intersection — Red

**Fig. 3—Method of designating different improvements on atlas sheets.**

provements which have been made in the particular street in question and information showing where data concerning same can be found in the filing cabinet and field books, the latter containing all data taken in the field.

Subdivision plats are kept in folders, one folder at present being devoted to each section. Each plat is given a number, which is prefixed by the number of the section in which it is located. These numbers correspond to their respective numbers on an index map, which is a small city map on which all subdivisions are indicated and numbered.

A system has been developed to show at a glance our system of sewers, drains, watermains, pavements, sidewalks and house numbers; this consisting of sets of atlas sheets, blue line on linen cloth, measuring 32" x 29" (which allows a 2½" binding edge on one side), each sheet having drawn thereon a quarter section of the city, scale 1" equals 100'. One sheet for each set of such atlases shows the entire map of the city, divided into quarter sections and each quarter section numbered, this sheet serving as an index map. Each atlas sheet has a number in the lower right corner corresponding to the number of the quarter section shown on the index sheet.

The entire system of sewers and drains is put on one set of atlas sheets. watermains on another, house numbering on a set, etc.

Each water valve within the city is identified by number. These numbers are placed in a book in numerical order and immediately following the number is shown the location of the valve and the tie to it. In this way it is always possible to locate a valve even should the ground be covered with snow.

It is now contemplated to make up an assessment atlas which will show all improvements that affect a parcel of property. This will aid the collection department to be more efficient in the collection of special assessments.

The house-numbering atlas shows a square for each parcel of land occupied by a house, inside of which square appears the number of the house, and a record is kept of the date a number is assigned to a house, the number, description of the property involved and the direction the building faces. This record is especially valuable when the collector is called upon to look up assessments bills against a street address and the legal description is not known.

From the foregoing it can be seen that, although these records could perhaps be improved upon to a certain extent, they are so kept as to enable the engineering office to give efficient service to the public.

# Mapping for Public Works Planning

There can be no question that every engineer interested in the planning of public works of almost any type appreciates the value of the Geological Survey maps and such others as may be available giving the topographical and other features of such areas as may be covered by work he has in hand. It is therefore good news to all such engineers that PWA alloted over $6,000,000 to various government bureaus for carrying out, through various types of mapping activities, the greatest inventory-taking of the natural features of the United States ever recorded in so short a period.

Through use of these funds, maps are being brought up to date and extended by the Forest Service of the Department of Agriculture; the Bureau of Air Commerce and the Coast and Geodetic Survey, both of the Department of Commerce; the Soil Erosion Service, Geological Survey, and General Land Office, all of the Department of Interior. Millions of acres of land and thousands of miles of water are being mapped, engaging the services of several thousand surveyors, draftsmen and photographers.

The Soil Erosion Service is completing the world's largest aerial mosaic map, composed of 7,000 separate photographs covering 24,500 square miles. The Forestry Service has prepared a base map covering four million acres as a preliminary to detailed maps to aid in forest planting. Most generally useful will be the extension of the Geological Survey maps, and $2,400,000 has been allotted for this service.

Surveyors will be interested in the work being done by the General Land Office, which is spending $1,000,000 in surveying public lands, of which 1500 million acres still remain unsurveyed. Those whose work is located at harbors or other points along the coast will be aided by the work of the Coast and Geodetic Survey, which is making revision surveys of the intracoastal waterways of the Atlantic and Gulf coasts and the various ports and harbors along the Atlantic and Pacific coasts, and offshore hydrographic surveys of the continental shelf in which echo soundings are being used.

Practically all of this money is being paid in salaries to engineers, surveyors and other technical men or their assistants; and thus is doubly serving members of these professions.

# Pennsylvania Highway Department's Notable Quadrennium

Distributing aggregate cover-coat on a Pennsylvania highway

*More miles of good roads were built by the Department of Highways of Pennsylvania during the four years 1931-1934 than were improved during the entire previous history of the State highway system. Moreover, in every branch of highway work improved methods and economies were introduced. Several articles have appeared in* PUBLIC WORKS *during this period telling in detail of much of the most important work done by this administration. A condensed review of the four-years' accomplishments has been prepared as a report of the Department, and from this we have made abstracts of the most notable features.*

THE Department of Highways of Pennsylvania is responsible for the maintenance and construction of 33,387 miles of State highways and 27 miles of State aid roads in boroughs—more than one third of all the public highways in the State. Also it is responsible for the maintenance and repair of approximately 48,500 miles of second-class township roads, and for the maintenance and construction of over 11,500 bridges. This is an increase from the total of 13,562 miles in 1931.

Of these roads, there remain to be improved about 500 miles of the original 3,100 miles of "Sproul" highways; 6,400 miles of the 20,156 miles of rural routes, and about 200 miles of other roads. There have been completed 10,998 miles of new pavement, 395 miles of reconstruction, 1,966 miles of resurfacing and reclamation, and 5 miles on grade crossing elimination projects; and in addition, 860 miles are under construction and 83 miles are scheduled for construction by contract.

The Department has spent during this period $236,818,420, of which $74,715,645 was spent in 1934. The cost of the various types of pavement ranged from $4,500 to $65,000 a mile, with some exceptionally expensive projects running up to $272,620 for 0.96 mile. Over 3,000 bridges were reconstructed at a cost of more than $12,000,000.

### *Work Relief*

*"During the past three years the Pennsylvania Department of Highways has afforded more re-employment than any other single agency in Pennsylvania. Throughout this period the Department has employed more labor than any industrial concern in the State."*

In order to provide maximum use of common labor, local stone has been used extensively as a material for the base course, obtained from fields and fences, or quarried near at hand and knapped in place on the roads. More than 12,000,000 tons of local materials were used, with a decided saving in cost.

Work relief provided, mainly in constructing low-cost roads, averaged 40,000 workers in 1932 and 1933, and more than 57,000 in 1934. The week of peak employment, 76,232, occurred in January, 1934. Most of the work was carried on in two or more shifts. In order that the most needy might be assisted and politics be eliminated, all the common labor was obtained from county emergency relief boards and re-employment agencies designated by the Federal Government.

### *Grade Crossing Elimination*

During the four years, $14,294,345 has been spent on 137 completed grade crossing projects, and 18 are now under construction, estimated to cost $963,314. The projects provide for the elimination of 68 grade crossings, reconstruction of 44 bridges and construction of 11 new ones, relocation of 47 crossings, and construction of 19 new grade crossings.

In addition, 17 projects have been ordered for construction by the Public Service Commission at an estimated cost of $524,596. Also, the Department has installed 39 flashing signals at railroad crossings and shared in 28 installations of advance warning yellow flashing signals.

### *Low Cost Roads*

Demands for improvement of rural roads made imperative the development of low-cost types of construction. (See PUBLIC WORKS for November and December, 1934). Those most used included oilbound penetration, premixed materials, or heavy surface treatments, on native stone, slag, "red dog" (incinerated culm), flint, gravel, or commercial stone bases.

During the four years, 178,000,000 gallons of bituminous materials were used; 39.6 million for retreating 13,865 miles of macadam, 9.3 million for laying dust on 2,102 miles of earth roads, 20.9 million for patching road surfaces, 1.7 million for sealing joints and cracks, and 106.4 million for construction and reconstruction of bituminous macadam pavements.

### *Organization*

In spite of the several-fold increase of work done, the salaried personnel strength of the Department increased from 2,095 in January 1931 to only 2,214 in

**Secondary road, full width between fence lines utilized**

January 1935, and the annual payroll of $3,699,140 was decreased to $3,515,138.

Practically all of the increase in salaried personnel was in assistant superintendents, the number of which was increased from 154 to 242 in 1934, when the Department was made responsible for 48,500 miles of second-class township roads. (Under the township system of maintenance, supervision over the road work was performed by more than 4,300 supervisors). This 48,500 miles included about 2,000 miles which had fallen into disuse and grown up with underbrush and, in some cases, planted to wheat, corn and other crops. The supervisors had claimed 53,000 miles, but the other 4,500 simply could not be found.

***Other Advancement***

A new bridge standard was developed, consisting of a timber floor on I-beam stringers and a timber or flexible steel guard rail—simple in design, reasonable in cost and durable, and permitting rapid construction. Over 800 bridges of this type were constructed.

Over a thousand miles of guard fence was erected, 793 miles on the old system, 234 miles on the rural system, and 0.75 mile on State institutional roads. These included steel plate, woven wire, wire tape and metal strip types. Snow fence was erected in the fall of 1934 to a total length of more than 7.5 million feet, or 1400 miles. The snow removal program has increased until, during the winter of 1934-35, it included 11,839 miles on the old system plus the most important routes on the rural system, and cost $2,388,000, of which $546,400 was spent on the rural system.

***Equipment***

Every effort has been made to improve the standard of the road building equipment. Approximately 2300 pieces of old units, so worn or obsolete as to be uneconomical to operate, were disposed of, about half of them surplus war material distributed by the Federal Government fourteen years ago, 600 of which were motor trucks and 133 tractors. To replace these and meet the increased demands, 4800 pieces of equipment were purchased during the four years at a cost of over $4,000,000, these including 571 motor trucks, 96 tractors, 506 automobiles, 108 personnel buses, 98 road rollers, 476 power graders, 319 drawn graders, 12 oil distributors, 8 power shovels, and 827 snow plows.

At present the Department's inventory of major equipment, such as trucks, tractors, automobiles, rollers and graders, totals over 7,700 units—roughly 2,400 more than at the beginning of 1931. The substitution of new equipment for that discarded effected operating economies and expedited the work.

***Safety Organization a Money Saver***

A Bureau of Safety was organized to reduce accidents to the Department's employees, among other purposes, and so successful has its efforts been that the decrease in injuries to workers has resulted in a marked reduction in compensation costs. In 1934 the premium rate for compensation insurance was reduced to $2.28 per $100 of pay roll, the rate being fixed solely upon the Department's accident experience. (The base rates for general industry are $6.75 for road construction and $7.60 for quarrying.) "On the basis of the pay roll of the Department for the fiscal year 1933-34, the reduced rate fixed for this year would produce a saving of $284,000 in compensation insurance premium. The fact that this reduced rate was attained with labor largely comprising relief workers, mainly untrained for the tasks they have been performing and consequently much more prone to accident then a trained and stable force, make this record more remarkable."

To obtain this result, a safety organization was set up embracing supervisory personnel in each county. First-aid instruction was given to over 5,000 employees; safety equipment was provided, including more than 100,000 pairs of approved goggles, sufficient to provide protection for every worker exposed to eye hazard; operators' platforms for use on chip spreaders; safety rails and canopy tops for use on trucks transporting workmen; and many other devices of tested value. Safety regulations were developed and strictly enforced. Periodic safety meetings and first-aid classes were conducted in all maintenance districts.

## Rubber, Iron and Sandstone Blocks for Paving

Milan, Italy, is experimenting with a number of types of pavement, among them being rubber, cast iron and sandstone.

The rubber tiles or blocks have been laid in a section 100 feet long on a street with heavy vehicular and pedestrian traffic. The blocks are rubber composition, about 8 by 11 inches, and 8/10 of an inch thick, with dovetailed edges. They are laid on a thin asphalt cushion on a concrete base eight inches thick.

The cast iron blocks have been placed on a section 180 feet long and 40 feet wide. The base is concrete eight inches thick. The blocks are equilateral triangles with 8-inch sides, about 1½ inch thick at the edges. The under side is hollowed out and the top surface is roughened by small knobs. A block weighs about five pounds. The blocks are laid on a thin layer of cold powdered asphalt and hot tar is applied along the joints between blocks. A light covering of sand is placed on the surface.

On the same street with the cast iron blocks, a section was laid using blocks of hard sandstone (gritstone). The blocks are about 8 by 4 by 2 1/3 inches with a projecting lower edge which holds them about one-half inch apart. The joints are filled with asphalt filler. The appearance is similar to glazed yellow brick.

# Recent Works for Public Sanitation in the South

***Southern Communities, Small and Large, are Installing and Improving Water Works, Sewerage and Refuse Disposal Systems***

OF ALL public works construction contemplated by the recovery and re-employment program of the Federal Government, "the further development and improvement of water works and sewerage systems will provide the maximum social return in betterment of health and sanitary safety." So say the Directors of the American Water Works Association in a resolution adopted January 15th and sent to the members of the Senate Committee on Appropriations. And we believe that all sanitary engineers and most municipal officials will heartily endorse this opinion.

On several pages following, we give descriptions of some of the outstanding water works and sewerage jobs which were put through in five of the Southern States last year, most of them with Federal aid. In selecting these, the aim was not only to inform sanitary engineers of the latest developments in sewerage and water supply plants and methods, but also to show to what extent progress is being made by the several states, with a view to stimulating more activity by the backward ones. The opportunity offered by the large sums to be provided by the Federal government for public works shoould be taken advantage of by communities in all states, but especially those where little work has yet been done.

Many of the plants described were built to serve small communities—some of them very small; for it seemed to us that it is these especially which need encouragement. The larger cities, already provided with water and sewage systems, are pretty certain to add extensions as needed; at least, they know how although they may hesitate about making the necessary expenditures.

But towns of six or eight hundred (or even as many thousand) population are apt to think of public water supplies and sewerage as luxuries which they cannot afford. They need to be shown that these are no longer luxuries but are necessities in a civilized community; and that they *can* be afforded, especially with the Federal aid which can be had.

With the encouragement should also go a word of warning. No matter how small the plant, it should be designed and constructed by a qualified engineer. That even the smallest of the plants described herewith was so designed and constructed is evident from the fact that all of them were endorsed to us by the state health authorities. To such authorities the towns in every state can confidently turn for encouragement and guidance.

## Alabama

Considerable sewerage and water supply work was done in Alabama last year, most of them typical small jobs. A list of those completed, under construction or approved, has been furnished us by G. H. Hazlehurst, chief engineer and director, State Bureau of Sanitation. These include: *Waterworks*—Arab, Brookside, Calera, Castleberry, E. Brewton, Fairhope, Falkville, Guin, Hamilton, Hanceville, Heflin, Lincoln, Moundville, Springville, Stevenson, Sulligent, Sylacauga, Thorsby and Vincent. *Sewerage*—Andalusia, Carbon Hill, Fairhope, Guin, Irondale, Springville, Sulligent and Talladega.

## Florida

Construction of several water works plants and extensions was begun in Florida during the past year. A new plant is being installed at Lake City—well supply, alum treatment, sedimentation and final chlorination. Another one under construction at Pahokee takes its supply from Lake Okeechobee and includes a complete filtration plant. The largest job (to cost $560,000) is at Miami, which city is replacing seven miles of wood stave pipe with cast iron, building new reservoirs, etc. This last is described in the following pages.

Only one sewage treatment plant was built in the state—that at Tallahassee; but two are to be built at Pensacola with PWA funds this year.

## Georgia

The outstanding water and sewage plant projects in Georgia during 1934 were as follows, according to the State Department of Public Health: *Water*—Ellaville, iron removal plant; CWA labor. Macon, filter units at water plant, PWA loan and grant. Buford, filtration plant, CWA labor. *Sewerage*—College Park, separate sludge digestion and trickling filter, CWA labor. Decatur, Imhoff tank, trickling filter with rotary distributor. Marietta, separate sludge digestion, trickling filter with rotary distributor, CWA labor.

There were also other jobs of no special interest.

## Mississippi

During 1934 not a single water supply job was executed in Mississippi and only one sewage treatment installation. This, the reconstruction by CWA labor of an inadequate plant, is described in this issue.

## Virginia

The outstanding waterworks, sewerage and refuse destruction projects constructed in Virginia during 1934 were, according to the Director of the State Department of Health: A sewerage project including a treatment plant for all of Arlington County; a sewage treatment plant and a refuse incinerator at Williamsburg; waterworks extensions and an incinerator at Newport News; replacing about 20 miles of wood-stave

pipe with cast iron by the Lynchburg water department; and an underground dam and reservoir for Harrisonburg's water supply.

The Arlington County project, now about 65% completed, will cost about $2,500,000. The Williamsburg sewer extensions and treatment plant comprises mechanically cleaned clarifiers, siphon tank, circular sprinkling filters with rotary distribution, sludge digestion tank and glass-covered sludge beds. Chlorine is applied to the raw sewage and effluent. The incinerator is described below. The Newport News water works extensions to filter plant and mains cost $200,000. The incinerator is described below. The Lynchburg replacement main cost about $600,000. The Harrisonburg underground dam, intercepting about 1,000 gpm. of underground flow, is an unusual but by no means new idea. (One was built across Pocoima Creek, California, more than 25 years ago.)

# Eight Thousand Tons of Cast Iron Pipe Replaced Wood at Miami

By William Sydow
*Director of Public Service, Miami, Fla.*

MIAMI obtained an allotment of $560-000 of PWA funds in September, 1933, for replacement of a pipe line, building two reservoirs and pumping station improvements, but litigation delayed letting of contracts until May, 1934, and the work is still under construction.

The two 2.5 m.g. reservoirs are of concrete, circular, 140 ft. diameter and 22 ft. deep. The walls, which are entirely above ground, are 18″ thick, reinforced with steel stressed not to exceed 6,000 lb. per square inch. In mixing the concrete, 1.1 cu. ft. of lime was added to each sack of cement, and 7 gallons of water. The tanks are covered with concrete roofs.

Condition of Miami wood stave pipe

The addition to the pumping plant consists of turbine-driven 8 m.g.d. centrifugal pumps, and a boiler operated by steam from incineration of municipal waste. The boiler is the vertical type, mounted adjacent to two incinerator furnaces in which is burned household refuse—garbage and rubbish mixed—fired just as it comes from the collection trucks. This is the third boiler so installed at the Miami incinerators, the other two having been in continuous operation since 1928 and 1930 respectively. (The original incinerators were installed by the Nye Odorless Incinerator Co. and were described in PUBLIC WORKS for March, 1930.) The total boiler horsepower now installed amounts to 850. Miami's experience with generation of steam from household wastes has been marked with success since the first construction in 1928.

Eight thousand tons of cast iron pipe is being laid, most of it in 36″ pipe to replace old 30″ wood stave pipe, with some 18″, 24″ and 30″ to replace similar sizes of wood pipe which connect 12″ wells with the central pumping plant.

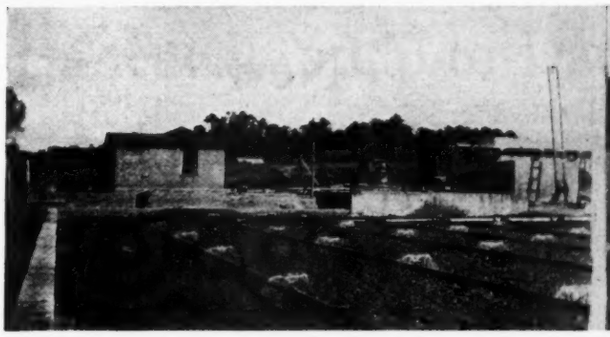
In 1924 the city laid a 30″ redwood line about seven miles long to conduct water from its main pumping plant to a booster pumping station located near the center of population. The pressure generally on the upper end of the line was about 25 to 32 lbs.; on the delivery end, from 3 to 7 lbs. In February, 1932, a substantial break occurred in this line. During the next fourteen months, thirteen other breaks disrupted the service. Excavations disclosed the pipe to be decaying from the exterior in numerous places.

It was at first thought the destruction was caused by termites or other insect life, but laboratory investigations did not disclose sufficient evidence to substantiate this theory. The trouble appears to be a result of fungus attack. In spots the wood became so soft that it would yield under pressure of the thumb and could be easily punched through with a blunt rod. The interior of the pipe is apparently in good condition. The pipe is laid in limestone soil which is alkaline and the bands show no great amount of corrosion.

In making repairs, the trench was opened immediately above the break and the earth removed in both directions from 10 to 25 feet until good wood was encountered. The section thus exposed was cut out and new staves put in. Frequently an occasional wet spot would be found, and over these a patch was made, consisting of a rubber gasket about 12″ square, held in place by a sheet of thin iron, the whole clamped to the pipe rods.

After the first two breaks had occurred the entire line was examined by random excavations and from the conditions disclosed it was deemed best to immediately begin preparations to safeguard the city water supply by installing a new line of different material. Accordingly plans and specifications were drawn to construct a 36″ cast iron line, which is now under construction. Miami is also supplied with another redwood line 36″ in diameter which was laid in 1928 and so far has had but one break.

The cast iron pipe line parallels the two wood lines for about one-third of the way, and then follows a different course which is slightly shorter than the old and offers cheaper construction possibilities, passing through a more sparsely settled portion of the city and not involving expensive pavement replacement. The new line is tested at 150 lbs. pressure, which permits future working pressures to become considerably higher than those at present.



Trickling filter in foreground. In background, right, primary sedimentation tank; center, separate sludge digestion chamber; left, pump and chlorinator house.

Construction of trickling filters, showing brick extension wall with concrete coping and brick piers. Gravel being dumped on replaced coke.

# Brookhaven Rebuilds Its Sewage Treatment Plant

By W. W. Chalk

*Consulting Engineer, Jackson, Miss.*

ALTHOUGH Brookhaven, Miss., treated its sewage in a twin Imhoff tank and contact bed, these had become so inadequate that in 1933 several suits were pending against the city for pollution of the stream, and the author was engaged to advise the city officials in the matter.

The bonded indebtedness of the city had almost reached its constitutional limit, and it was decided to utilize as much of the old plant as possible and ask aid of the federal government. The latter, through the CWA, furnished all the labor while the city furnished all material and the services of the engineer.

The plant constructed consists of a primary sedimentation tank, separate sludge digestion tank, sludge drying bed, trickling filters, pumping plant and chlorinator. The normal flow of domestic sewage is 500,000 g.p.d., which is increased to a little over 1,000,000 during heavy rains. The plant was designed for the larger amount.

The two outfall lines enter a 6 ft. diameter manhole, in which was built a bar screen. The sewage from this empties into a 10 ft. by 15 ft. pump pit. There were two 7.5 hp., 750 g.p.m. pumps in the old plant and these were connected in tandem to take care of the additional lift, and a new 30 h.p. 1350 g.p.m. pump was installed.

The primary sedimentation tank is 64 x 17 ft. x 13 ft. deep, with a double hopper bottom from which the sludge is withdrawn by means of an underdrain. A walkway runs down the center of the tank and crosswalks at 17.5 ft. intervals to permit removing scum and other floating material.

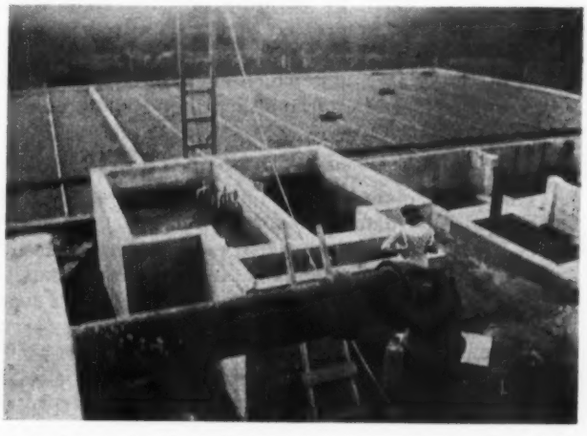
For the sludge digestion tank, the old Imhoff tank was altered by removing the sides and bottom of the sedimentation chamber, leaving only the outer walls, which gave a tank 90′ x 30′ x 20′ deep. A walkway was constructed just above the overflow to permit the attendant to break up the scum.

Two trickling filters 90 ft. square and 6.5 ft. deep were obtained by reconstructing the old contact beds, which had contained 2½ to 3 ft. of slag ranging in size from 3″ to 5″. To give the necessary depth, the walls were raised 4 ft. by laying brick walls with a 6″ concrete cap. All the old slag was removed. To support the distributing pipes, brick piers were built on 12 ft. centers. The collecting system was formed of 10″ split tile supported on four bricks to the tile, laid in lines spaced 2½′ centers, directly on the old bottom, thus saving the cost of a more modern underdrain system. The old slag (which was clogged with sludge) was cleaned by means of fire hose, the slag meantime being turned over by use of corn forks. This was replaced in the filter and on it was added 4 ft. of gravel, graded from 2¼″ to ½″. To save money for the city and give employment to labor, this gravel was mined and washed (by means of a plant designed by the engineer), this requiring 120 men per day of 16 hours for a period of 3 months. The distribution system is composed of 12″ and 4″ cast iron pipe, into which the spray nozzles are threaded.

A new sludge drying bed was built, 50′ x 75′, consisting of an underdrain system, over which is placed 2 ft. of selected gravel from ¼″ to ½″ covered with 12 in. of sand ranging from ¼″ to 30 screen. The sludge is distributed through a split 10″ tile. The extreme edges of the bed are 6 in. lower than this tile and a very even spread of the sludge over the bed is obtained.

A wet solution two-way distribution chlorinator was installed to provide for chlorinating both raw sewage and filter effluent.

The plant has been in operation since October 1, 1934, and has handled perfectly a peak load of over 1,000,000 g.p.d.



Twin dosing plant in center foreground; at right, separate sludge digestion chamber; background, two trickling filter beds.

# New Water Supply at Sylacauga

By H. F. Wiedeman
*Wiedeman and Singleton, Engineers, Atlanta, Ga.*

**Sylacauga water plant under construction. Above, filter plant and pumping station. Below, dam, with reservoir in the rear.**

SYLACAUGA, population approximately 6500, has been obtaining its water supply from springs in limestone, supplemented by an air-lift pumped well. Because the water from the limestone was hard and often polluted and was not sufficient in quantity, in dry weather, to supply the average daily demand of 400,000 gallons, another source of supply was sought.

Two sources were available—Coosa River, about 14 miles from the city, and Tallaseehatchee Creek, about 4 miles distant, both furnishing soft water. The construction cost of developing the former was prohibitive and the latter was selected.

Tallaseehatchee Creek has a drainage area of 33 sq. mi. above the intake, which area would ordinarily be sufficient to supply the desired 1,000,000 gallons per day without storage. But the gradient of the stream is steep and the shale rock is exposed or close to the surface over a large percentage of the drainage area, which conditions promote quick runoff and consequent low flow during dry periods, and storage therefore was necessary.

A reservoir with a storage capacity of 40,000,000 gallons was created by building an earth dam about 20 ft. high with a reinforced concrete spillway. An intake tower is located about 500 ft. up stream from the dam, in which are gates which enable the operator to draw water from the top, mid-depth or bottom, as conditions warrant.

### *Filtration Plant and Distribution System*

A filtration plant and pumping station were located adjacant to the dam. The former comprises two filter units of 500,000 gpd capacity each, a sedimentation basin giving 6 hours' retention at normal rates, a gravity mixing basin giving 20 minutes retention, and a clear water well of 150,000 gallons. Water flows by gravity from the intake tower to two low-lift pumps, one a 700 gpm centrifugal driven by gasoline engine and electric motor, the other by a 350 gpm motor-driven centrifugal. There are in the same building two high-life units of the same capacities and drives.

Four miles of 12 in. c. i. pipe brings the filtered water to the city distribution system; part of this line being laid with pipe which had been in service for 45 years in an Alabama industrial plant. A 250,000-gallon welded steel standpipe 60 ft. high was constructed on an elevation near the city. An existing 50,000-gallon elevated tank in the center of the city will remain in service.

The city owns its own electrical distribution system and purchases power at wholesale rates from the Alabama Power Co. A 4,000-volt transmission line was run from the city system to the plant, also a telephone and water level signal line. As attractive electrical rates are available for off-peak operation, the plant will be operated only at night or during hours when the electrical demand in the city is low.

The cost of the project was $135,000, which was financed by a loan and grant from the PWA.

## New Sewage Disposal Plant at Decatur

Sewage from the city of Decatur, Georgia, population 13,000, empties into several different outfalls. The disposal plant just completed serves the southeastern part of the city and drains into Shoal creek.

The design capacity of the plant is 300,000 gpd. Complete treatment is provided, consisting of bar screen, Imhoff tank, sprinkling filter and chlorination.

The Imhoff tank is of medium depth and has three flow-through compartments, arranged for reversal of flow. The dosing tank is built adjacent to the Imhoff tank and connects to the filter through a 10″ main. Sludge is drawn hydraulically onto four sludge drying beds.

The filter is of concrete, circular design, 90 foot diameter and 7-foot depth of stone. Underdrains are on 30″ centers and discharge into an open flume. Sewage is distributed by a four-arm rotary distributor operating on 24″ head.

Chlorinating chamber is located adjacent to the filter and chlorine is fed through dry-feed chlorinator located in house directly above the chlorinating chamber.

The plant was only placed in operation on December 1st, 1934, therefore no records of plant results for a period of time are available; however, tests made to date indicate a highly satisfactory degree of treatment.

The plant was designed and supervised by Robert and Company, Inc., architects and engineers, of Atlanta, Ga.

# Hanceville's Up-to-Date Iron Removal Plant

By F. C. Basenberg
*Polglaze and Basenberg, Consulting Engineers*

HANCEVILLE, Ala., with a population of only 780, now is supplied with an adequate, safe, potable public water supply, through the construction last year, by means of a PWA loan and grant, of a well supply, iron removal and filtration plant, elevated tank and distribution system. The total cost, including land, legal and engineering expenses, and interest during construction, was $19,600, of which $3,600 was the PWA grant, leaving a net cost of less than $21 per capita.

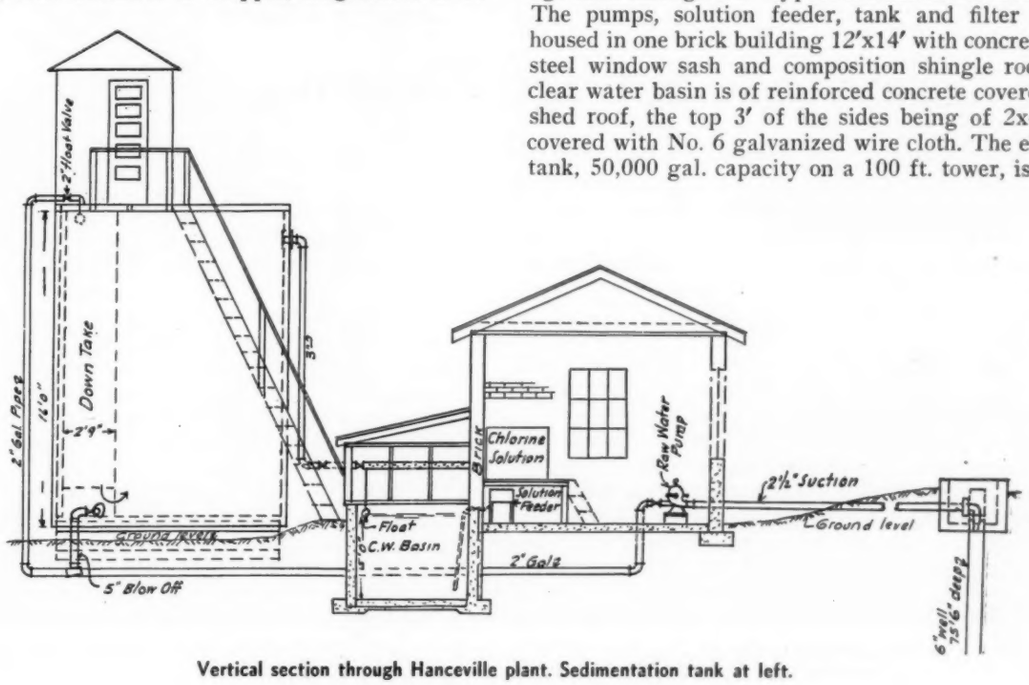
Hanceville is an agricultural town situated in one of the best agricultural sections of the state. It had never had a public water supply, and when PWA loans became available it arranged to obtain one through a loan and grant. The town officials engaged Polglaze & Basenberg of Birmingham to act as engineers in preparing plant, obtaining loan and supervising construction. Plans were completed in April 1933, and, after overcoming government red tape, construction was begun, and completed on December 8th, 1934.

Fortunately a source of supply was already available —a 6 in. well 98 ft. deep put down 60 years ago by the L & N Railroad Co., but abandoned 20 years ago when the line was relocated a mile distant. This well was said to have yielded 200 gpm in railroad service; and a test in 1933 gave 35 gpm with a 2 ft. draw down and 78 gallons with a 4 ft.—more than ample for the town's needs. The quality, however, was not so satisfactory, for there was an iron content of 4.0 ppm, 21.5 ppm free carbon dioxide, 75.2 ppm calcium bicarbonate, and the pH was 6.9. H. G. Menke, of the State Health Dept., found that by using 4.75 grains per gallon of lime, the iron was reduced to 0.15 ppm, the carbon dioxide entirely removed, total hardness to 88 ppm, magnesium to 54 ppm and the pH raised to 8.5. A plant was designed to provide lime treatment, aeration to prevent a flat taste, and chlorination.

At the present time there are only about 450 potential consumers; as there are no industries, the actual consumption will probably be 25 to 30 gpd per capita, and a plant capacity of 50,000 gpd was considered abundant and was taken as the basis of design.

From the well the water is lifted a total of 25 ft. to the top of a cypress sedimentation tank 12′ diameter and 16′ deep, giving 6 hrs. detention. As it enters the tank, lime is applied with an Infilco No. 8 dry chemical feeder, which rests on a platform on top of the tank and is enclosed in a corrugated galvanized iron building 8′x5.5′. The treated water descends through a vertical cylindrical cypress mixing chamber 2′ 9″ diameter inside the large tank, extending the full depth of the tank but with alternate staves cut off 24″ above the bottom. Thorough mixing is effected by a spiral motion of the water down this chamber. The water overflows through a 3″ pipe, which extends to and across the clear water basin, that portion above the basin being perforated with ½″ holes, through which the water is sprayed into the basin for aeration. From here the water is pumped, with a Westco 35 gpm service pump direct connected to a 3 hp motor, through a 5 ft. diameter International pressure filter into the distribution system and an elevated storage tank against a total head of 140 ft. A solution of HTH is fed from a cypress solution tank, through a Phipps-Bird solution feeder, into the clear basin at the pump suction, at a rate sufficient to give a residual of 0.2 ppm.

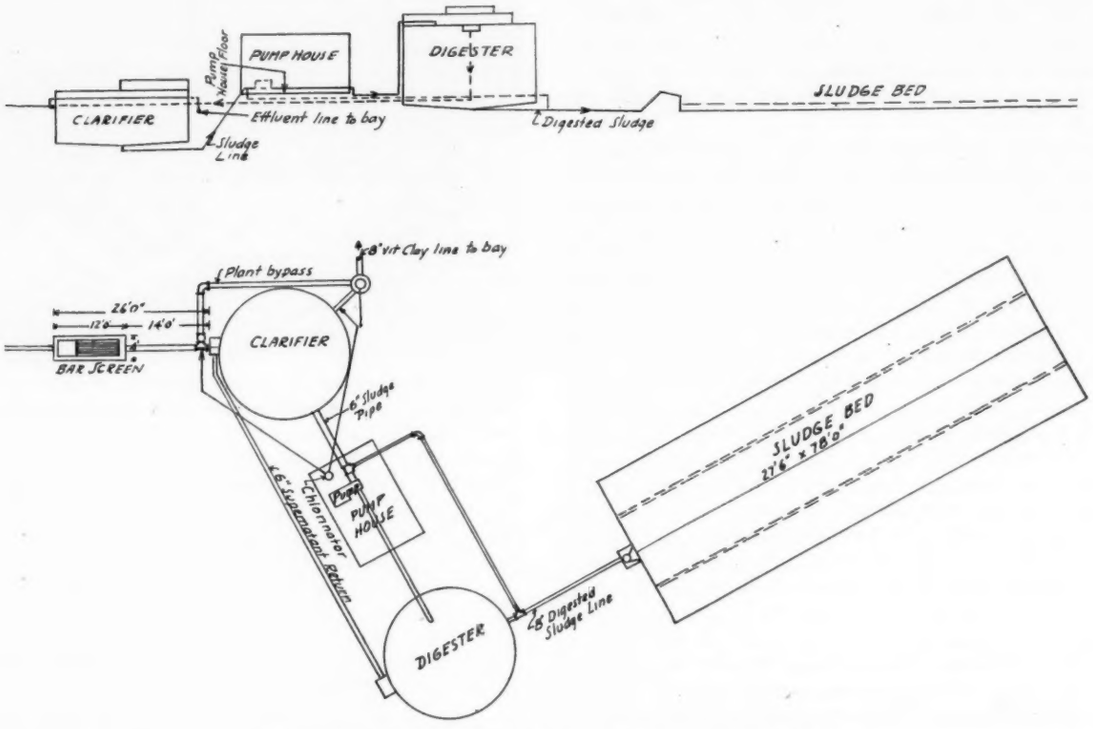
Wash water for the filter is obtained from the storage tank through a 2″ bypass around the station meter. The pumps, solution feeder, tank and filter are all housed in one brick building 12′x14′ with concrete floor, steel window sash and composition shingle roof. The clear water basin is of reinforced concrete covered by a shed roof, the top 3′ of the sides being of 2x4 studs covered with No. 6 galvanized wire cloth. The elevated tank, 50,000 gal. capacity on a 100 ft. tower, is on the




**Vertical section through Hanceville plant. Sedimentation tank at left.**

same site as the plant two blocks from the business district. The distribution system consists of 400 ft. of 8" pipe; 6" pipe surrounding the business district and extending 2,000 ft. to the school, on which are eight 6" fire hydrants; with the rest of the mains of 1½" cast iron pipe provided with tapping bosses. There are 84 services of ½ in. copper pipe, including corporation cock, curb cock, meter and box, and material on hand for 16 more.

The aim of the engineers was to give the town the simplest and best iron removal plant possible without unnecessary or expensive equipment, keeping the cost down to the point where the town could pay operating expenses, interest and principal without undue burden.




**General plan and elevation of Fairhope sewage treatment plant**

# Fairhope Sewage Treatment Plant

Fairhope, a town of about 2,000 population located on the eastern shore of Mobile Bay, is both a winter and summer resort and is rather unusual in several ways. It is known as a "Single Tax colony," patterned in many ways after the ideas advanced by Henry George, and in it is located the "Organic School" established by Mrs. Marietta Johnston which has an international reputation.

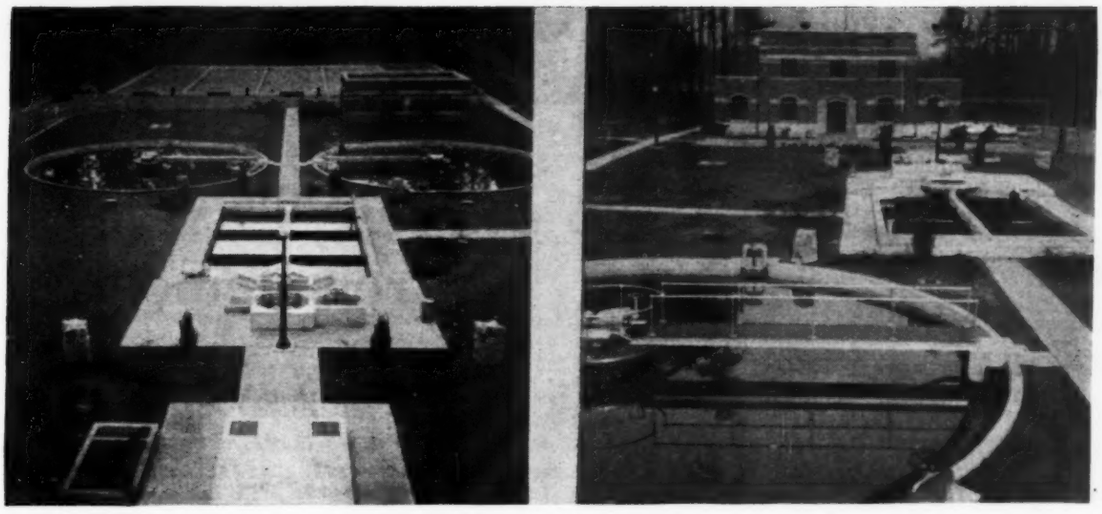
The town has received an allotment of $160,000 from PWA funds to install water works, sewer system and sewage treatment plant and to pave its streets. Bids were received for the water and sewerage system last November and construction of the well for the water supply has been started. It is expected that the sewer and other water works features will get under way during January. (This was written January 8th.)

The sewage disposal plant will consist of a bar screen, clarifier, pump, digester and sludge bed. The screen consists of inclined bars in a pit 4 ft. wide by 12 ft. long. The screened sewage flows 15 ft. to a circular clarifier 20 ft. in diameter with 5 ft. depth of sewage. From this the sludge is pumped 50 ft. to a digestion tank 20 ft. in diameter and about 12 ft. deep. The overflow liquor from the digester returns by gravity to the entrance to the clarifier; the digested sludge flows by gravity 35 ft. to a sludge bed 78 ft. by 27 ft. 6 in. All the equipment will be Dorr equipment.

A chlorinator is to be installed for dosing both the influent and the effluent of the clarifier. The latter is discharged into Mobile Bay, into which the outfall line extends for 500 feet. The entire plant except the bar screen can be by-passed, permitting the complete shutdown of the plant in the winter, when there is no bathing in the bay.

The plant is located at the northern corporate limits of the town, on a bench in a ravine surrounded by beautiful pine trees. Much care and thought were given to the architectural features of the entire plant, that it might have a pleasing appearance.

The engineers for this improvement are J. B. Converse & Co. of Mobile. The contractor for the plant is the Dyson Company, of Fairhope.



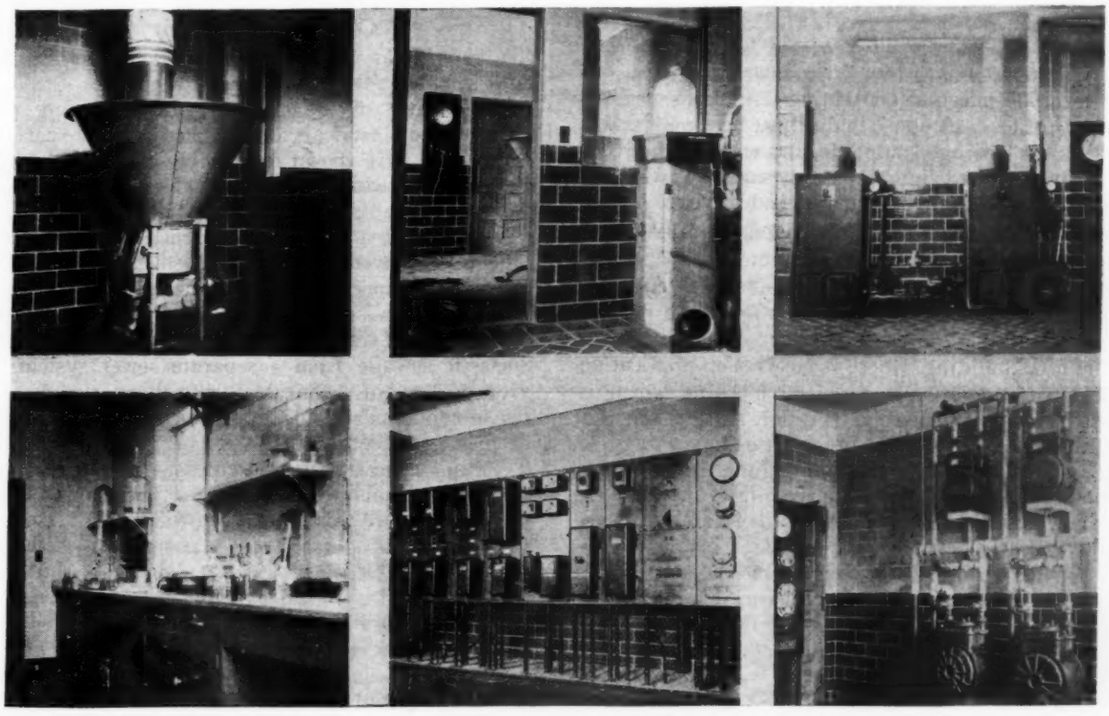
**Left, view of Shades Valley plant from operating building, and, right, view from top of garage, shown in upper part of left view.**

# The Birmingham Shades Valley Plant

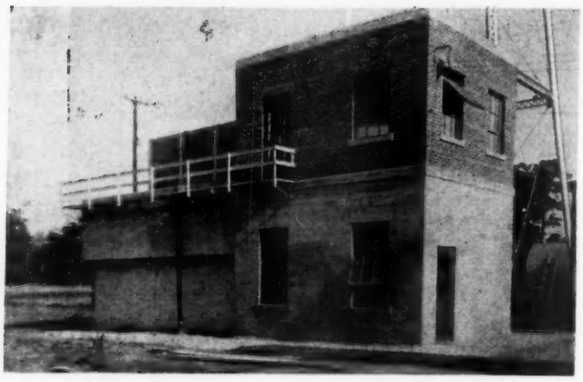
The Shades Valley treatment plant, one of the best known southern engineering accomplishments of a decade, was described in PUBLIC WORKS (Feb., 1934); in brief, it is designed to treat 2 mgd as a chemical treatment plant, and 4 mgd as a primary treatment plant. The plant can be operated in a variety of ways. Best results appear to have been obtained to date by using one of the tanks for primary sedimentation, applying chemicals to the effluent and providing final sedimentation. The sludge from the final settling tank is returned to the raw sewage channel and sludge from the primary settling tank is pumped to the digesters.

This method of operation has a number of advantages which are briefly as follows: (1) The amount of chemicals required is less than when treating the raw sewage. (2) The chemically precipitated sludge returned to the raw sewage reduces odors, gives greater removal of solids in the primary tank and produces a more concentrated sludge to discharge to the digestors.

*(Continued on page 18)*



**Interior of Shades Valley plant. Upper row, left to right, dry feed machine, chlorinator, and gas burning heaters. Lower, a corner of the laboratory, the switchboard and the gas meters.**



Ellaville iron removal plant

# Solving a Problem in Iron Removal

By H. F. Wiedeman

THE iron removal plant at Ellaville, a community of approximately 1,000 persons, is an illustration of the solution of perhaps the most perplexing class of problems that confront the sanitary engineer—designing for a small municipality, whose needs are as urgent as those of a larger one, but whose financial resources are limited, an adequate plant that will function efficiently with minimum upkeep and operating expense, though in charge of an unskilled operator.

In Ellaville, as in most small communities in the southern half of Georgia, water is obtained from a well and contains carbon dioxide, iron, manganese, hydrogen sulphide and is hard. The prevailing opinion among officials of most such communities is that a plant to treat such water would cost more to build and operate than they could pay, or would involve technical processes which could not be carried on by their operating personnel. The Ellaville plant demonstrates that such works can be constructed at reasonable cost and be operated satisfactorily with non-technical personnel.

Ellaville obtains its water from a well having a capacity of 100 gpm and containing 1.44 ppm of iron, 60 ppm hardness, 40 ppm alkalinity, 61.5 ppm carbon dioxide, some hydrogen sulphide, and with a pH of 5.8. This water stained laundry and sanitary fixtures, stopped meters and corroded mains and services.

The plant consists of four spray nozzle aerators which are mounted on a reinforced concrete sedimentation basin and are surrounded by wood louvres. The raw water is pumped from the well through these nozzles and, after aeration, flows to a small concrete flume inside the filter building, where it receives an application of hydrated lime from a dry-feed machine which is mounted over the flume. The aeration reduces the carbon dioxide to 10 ppm and precipitates a considerable portion of the iron. The addition of lime then removes the remaining carbon dioxide, precipitates more of the iron and increases the pH. After the lime has been added, the water flows through a small gravity mixing flume having about 10 minutes' retention, then passes through a small sedimentation basin having about three hours' retention capacity, and then to a gravity filter of the conventional type, the effluent from which is discharged into the clear water well. The filter is washed with a centrifugal pump taking suction from the clear water well.

The plant is equipped with a small laboratory for making routine chemical tests. The usual method of controlling the operations is to adjust the lime application until a faint pink color is obtained with phenolphthalein, or until the pH reaches 8.5. This insures maximum precipitation of iron and prevents corrosion. After a few hours' instruction, the operator learns to make these tests and to wash his filter properly, and this is all that is really necessary for the control of the plant.

The effluent from the plant contains no carbon dioxide or hydrogen sulphide and only a trace of iron, and is now entirely satisfactory to the consumers.

The cost of this plant was estimated at $5,700, but the municipality was able to obtain relief labor for its construction and was, therefore, able to build it for approximately $3,500.

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## The Birmingham Shades Valley Plant

*(Continued from page 17)*

(3) The primary settling tank serves to equalize variations in sewage flow and concentration.

The results of two months operation during which the dosage of chemicals and the analyses were carefully determined have shown remarkable efficiencies possible by chemical treatment methods. The raw sewage which had an average B.O.D. of 80 ppm. (maximum 200 ppm.) was reduced to a B.O.D. of 10 ppm. or less in the final effluent. An average suspended solid content of 100 ppm. (maximum 300 ppm.) in the raw sewage was reduced to 9 ppm. or less in the effluent. These results were obtained when treating an average of 1 mgd. of strictly domestic sewage from a separate sewer system. The average doses of chemicals during this period were 440 lbs. of copperas and 70 lbs. of chorine per mg. The cost of chemicals average $5.40 per mg., and the total cost including fixed charges, laboratory, chemicals, power, supplies and maintenance was $23.65 per mg. The installation cost of this plant was $108,000.

This plant is operated on a seasonal basis, being used as a primary treatment plant only, except during the summer, when a high degree of treatment is required because the flow in Shades Creek is low and there is bathing a short distance down stream.

The plant was designed by Harry H. Hendon, sanitary engineer of the Commission of Jefferson County, Ala., consisting of W. D. Bishop, R. E. Smith and W. E. Dickson.

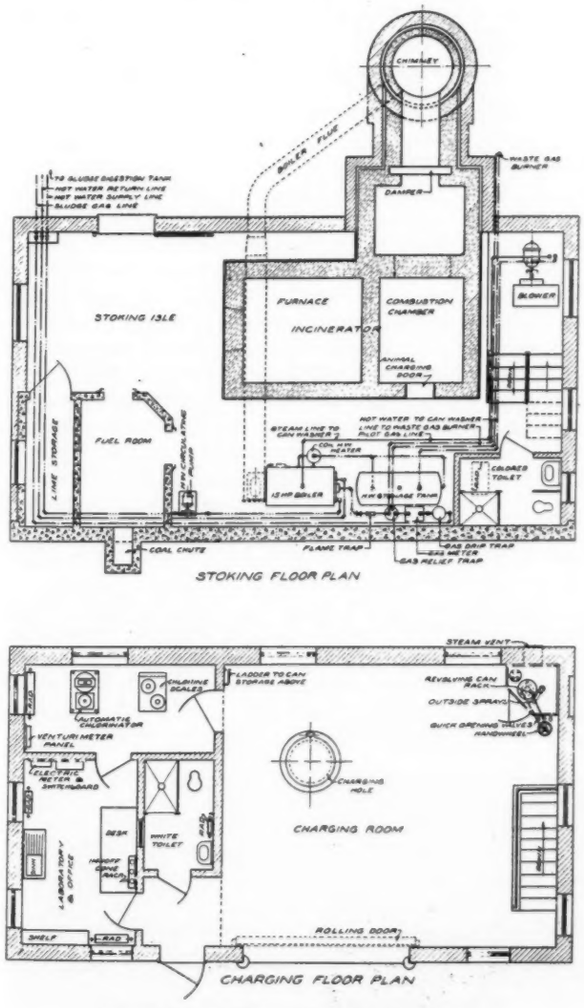
# Modern Refuse Disposal in Restored Williamsburg

By Wm. Martin Johnson
*Sanitary Engr., Wiley & Wilson, Consulting Engineers*

IN THE restoration of Williamsburg, Va., the "Colonial Capital" of the United States, to its former physical proportions and appearance, modern conveniences are provided in the houses but so concealed as not to destroy the original architectural feeling and effect of early colonial days. Sewers are laid in the streets, but out of sight; as is the sewage treatment plant, provided to eliminate pollution of the streams and oyster beds. In colonial days, ducks and pigs frequented the streets and aided in garbage disposal, but this feature is not being restored; instead, a most up-to-date system of refuse collection and disposal has been provided.

Garbage and rubbish are collected from the city and also from the Eastern State Hospital and the College of William and Mary, and are burned in an incinerator operated in combination with the sewage treatment plant.

*Can system of collection.* In line with the very latest and best practice, the city has supplied a good, substantial type of heavy-duty, galvanized garbage cans of 10 gallons capacity for residences and 20 gallons capacity for all commercial establishments. Each user was required to sign up for the number of cans to meet their requirements, and the commercial establishments were required to make small deposits on these cans. All cans are collected twice each week from residential sections and daily from the commercial sections; at which time a clean, sterilized can is left at the point from which the full can is collected. These cans are collected by standard city trucks at present, but it is proposed to place an order for a specially built truck suitable for this service at an early date. The cans are delivered to the incinerator building along with rubbish and other refuse, the cans being emptied directly into the incinerator furnace. The emptied cans are placed to one side and the truck loaded with clean, sterilized cans for the return trip to the city.




**Floor plans of incinerator of Williamsburg.**

The cans are made of plain (not corrugated) 10-gauge iron, hot galvanized after fabrication, with standard tight-fitting covers. The 10-gal. cans are 13″ diameter by 17.5″ deep, the 20-gal. ones are 16″ diameter by 23″ deep, made by the Wheeling Corrugating Co. The city bought 50% more cans than were placed in service immediately, thus obtaining car-load prices, and providing for replacement and extension of service.

The new trucks will have, in the front half, racks for holding cans, and the rear half will have a dump body for collecting rubbish.

*Can washing equipment.* A can washer of special design, built into a water-proof steel cabinet or enclosure, is provided in convenient location. This washer is arranged so that a can is inverted over a revolving rack which is provided with spray nozzles and brushes which thoroughly wash and scrub all inside and outside surfaces of the can at one operation. Alternate applications of scalding hot water and steam are applied through quick-opening control valves located on the outside of the cabinet. A single operator is able to wash the cans with ease, and also to assist in the general care and operation of the incinerator plant. The hot cans dry quickly after removal from the washer to a suitable storage space for reloading on the next outgoing truck.

The citizens fully appreciate the value of clean, sanitary garbage containers constantly at hand. This service is eliminating the individual disposal of refuse by burning on the premises and the collection of wet garbage by farmers in the vicinity of the city, both of which methods are unsightly and uncertain. The wet garbage from the college and hospital is fed to hogs on their own farms, and only their dry rubbish is brought to the incinerator.

*Incinerator.* The incinerator is a standard, 45-ton, Pittsburgh-Des Moines Steel Company plant and is located on the grounds with the sewage treatment plant. No auxiliary fuel is required as there is sufficient rubbish from the city to complete combustion of the wet garbage.

The incinerator building also houses a laboratory and office space for the sewage treatment plant, as well as the chlorinator and meter room. Space is also provided in this building for lime storage and fuel, as well as toilet and shower rooms for both white and colored help.

**Williamsburg incinerator. Sewage screen chamber can be seen at extreme left rear.**

Extra storage space for the surplus cans is provided in the roof space over the laboratory and office rooms.

*Boiler equipment.* On the stoking room floor level, adjacent to the incinerator, is located a 15 hp. fire-tube boiler which is fired by gas collected from the sludge digestion tanks of the sewage treatment plant. This boiler is equipped both with a gas burner and coal grates in order that steam pressure can be maintained by the use of coal if sufficient gas is not available.

This boiler furnishes steam and hot water for the can washing equipment, hot water for the shower rooms and laboratory, hot water for heating the separate sludge digestion tank and hot water for heating the office, laboratory, chlorinator and shower room spaces.

The sewage gas has a high B.t.u. value and its use in connection with the incinerator plant makes for economical operation of the two plants. A gas outlet is provided in the laboratory for use in running plant tests.

The screenings and grease from the sewage treatment plant are burned in the incinerator, or, when the incinerator is not being operated, may be burned on the coal grates in the steam boiler. Since the plant is located at the edge of a swamp, ashes from the plant are disposed of by filling in low places on the surrounding grounds. All organic matter is reduced to an ash and the tin cans and similar material fused to a clinker and are suitable for filling around the plant or for the construction of walks. The finer ash is suitable for sprinkling on the lawn around the plant.

The combined incinerator and sewage treatment plants are operated under the direct supervision of Raymond Miller, Superintendent of Streets and Sewers, who keeps complete daily records and submits weekly reports to A. L. Meisel, City Manager. One single shift sewage plant operator devoting part time to incinerator, one can washer and two garbage truck drivers complete the regular operating personnel.

The incinerator, sewage treatment plant and other sanitary improvements were designed by Wiley and Wilson, consulting engineers, Lynchburg, Va. and Richmond, Va.

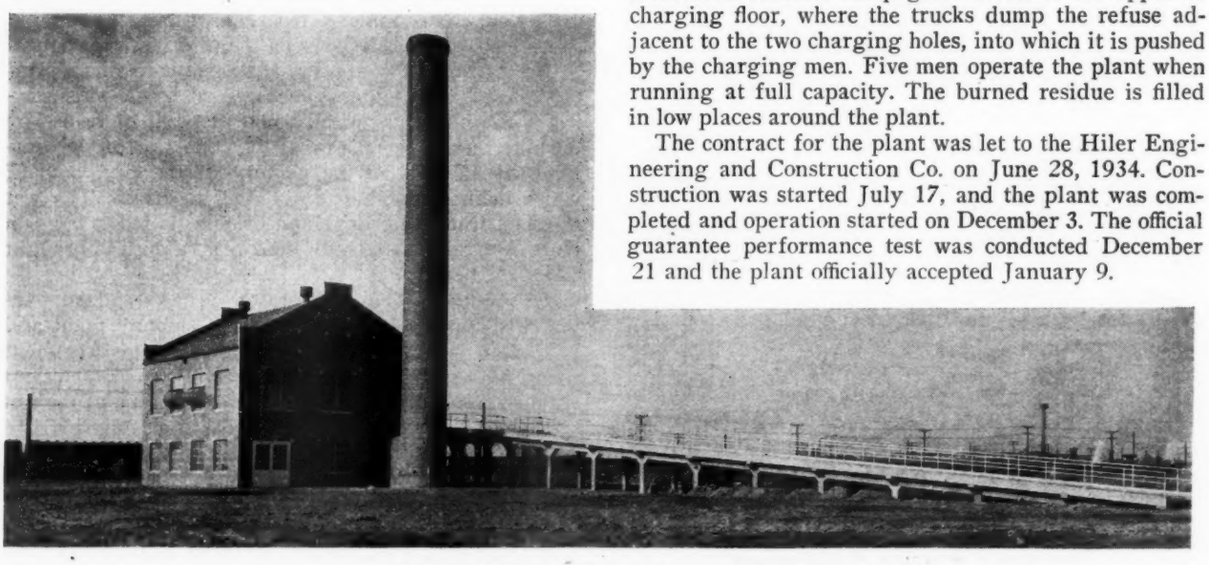
## Newport News Incinerator

This incinerator was a PWA project costing $61,850. It replaces a very unsightly and unsanitary garbage dump located within the city. Before this incinerator was built, the garbage and ashes were collected together, but when it went into service last December the city issued notices that separate containers must be provided for ashes and garbage. The Assistant Director of Public Works. J. A. McCarthy (to whom we are indebted for this information) states that their normal garbage collection, not including ashes, averages approximately 30 tons a day. The ashes are used for fills in road work.

The incinerator has a guaranteed capacity of 120 tons of mixed refuse per 24 hrs. without use of auxiliary fuel; the refuse to average 75% garbage and 25% rubbish and 60% moisture, all by weight. There are two rectangular, brick-set, steel-clad Hiler furnaces, arranged for either independent or simultaneous operation. Each furnace is a 3-cell unit with separate air preheater, forced draft fan and duct system. Any portion of the waste gases may be diverted into the preheater; or, if the refuse has a sufficiently high calorific value, use of the preheater may be dispensed with. All waste gases pass through a header flue to a firebrick-lined radial brick chimney 6′ 3″ inside diameter and 104′ high above the stoking floor; the gases heating two hot-water heating elements in the flue, by which a 250 gal. storage tank is kept filled with hot water.

The furnaces are housed in a reinforced concrete and brick 2-story fireproof building 57 by 46 ft. On the upper floor are an office and a men's room, each with a lavatory and ample supply of hot and cold water. A reinforced concrete ramp gives access to the upper or charging floor, where the trucks dump the refuse adjacent to the two charging holes, into which it is pushed by the charging men. Five men operate the plant when running at full capacity. The burned residue is filled in low places around the plant.

The contract for the plant was let to the Hiler Engineering and Construction Co. on June 28, 1934. Construction was started July 17, and the plant was completed and operation started on December 3. The official guarantee performance test was conducted December 21 and the plant officially accepted January 9.



**Newport News incinerator building and ramp.**

# The Editor's Page

## A Year's Highway Disasters Exceed a Century's Marine Ones

Outstanding marine disasters in the past hundred years have cost around 30,000 lives. These disasters have, for the most part, been striking and have been impressed on the public mind and consciousness for obvious reasons. Especially has this been the case when two or three such accidents have occurred fairly closely together, as has happened recently.

The fact that more than 30,000 lives are lost each year in automobile fatalities does not so impress the public consciousness. Marine disasters have resulted in new laws promoting greater safety in ocean travel, but the tremendous toll of highway accidents has not resulted in any adequate steps to reduce such hazards.

More roads, especially of the secondary type, so that present congestion of our main highways will not be necessary; wider roads, so that passing can be accomplished with a minimum of danger; wider and safer bridges and culverts; better alinement to eliminate blind curves and danger spots; better guard rails; and reduction of railroad grade crossings—these are among the important steps that must be taken to make highway travel less dangerous.

Rural accidents outnumber those in cities and villages about three to two. A part of this is due to better control of traffic, and also to lower traffic speeds, in such communities. Private passenger car accidents last year increased, while motor truck, taxi and bus accidents decreased.

The adoption of uniform traffic laws would help, but the biggest factor, we believe, is the reconstruction of our highways to care adequately for the increased volume of traffic and for the higher driving speeds now so common. There is no way in which unemployment relief money could be expended to better advantage than to use it to make the highways of the nation safer for its citizens.

## What Does a Snowstorm Cost?

The heavy snows that have blanketed so many sections of the country during the past two or three weeks raise the very pertinent question: What does a snowstorm cost? Delays to business, damaged automobiles and trucks, and blocked streets and roads are perhaps not subject to evaluation, but gasoline tax losses are. The 3c gasoline tax in New York state alone produces an income of $140,000 a day. (If it all went to paving, this would mean anywhere from 7 to 25 miles of new road daily). If this last storm kept half of the motor vehicles off the roads for only three days, (which is a low estimate, we believe) the loss in gasoline taxes would amount to $210,000 for the state and another $70,000 for the Federal Government.

Adequate investment in snow removal equipment would seem to be a paying proposition. In fact, New Hampshire estimates that it earns at least 5% return on all its snow removal activities, and figures in past issues of this magazine have shown that many states have found it cheaper to move the snow than to suffer gasoline tax losses during winter months; to say nothing of the greater damage done to uncleared roads because traffic is confined to ruts.

But there is a brighter side to the picture. A really good snow offers the overburdened gas-tax payer about the only chance he ever has to beat the tax by keeping his car at home. It's an ill wind that blows nobody good.

## Do Your Part to Forward Federal Aid

Within the past few days all PWA State Engineers have sent to municipal officials throughout their states request that information be sent to them as promptly as possible concerning "needed and useful" public works projects in their respective municipalities. The object of this national inventory is, in part at least, to enable the President to decide how much of the pending appropriation should be allotted to non-federal projects which are "urgently needed and of permanent value, which create future wealth or better standards of living."

Questionnaires are sent that call for considerable information, some of which may seem to be unnecessary for the taking of such an inventory. However, we urge all officials to answer them fully and immediately, so that, if there shall be delay or deficiency in putting through this year's re-employment program, it can not be laid to them.

## A Double Benefit to Engineers

The natives of the Saar have a saying that firewood warms you twice—once when you cut it and again when you burn it. And engineers are being benefited twice by six million dollars of the funds of the PWA which has been alloted to the mapping of the country—once by the direct payment of the money, most of which goes to them as salaries, and again by the information which will be furnished by the surveys and maps.

There must be few engineers who have done any designing who have not saved themselves much time and work and their clients much money by making use of the maps of the Geological Survey, the Coast and Geodetic Survey, and those prepared by other government departments. But there are still considerable areas of the country which have not been so mapped, and most of the maps now available need to be revised to correct a few minor errors and especially to show changes made during the past few years by both man and nature.

There is a danger that the usefulness of these surveys will be limited, or at least postponed, by a sudden cutting off of funds before the information has been recorded and published. For this reason, and to make the data available at the earliest possible date, it is greatly to be desired that the calculating, mapping and other office work needed to make the survey notes available to the public, be carried on coincident with the field work, and the maps published at the earliest possible date.

Sheeps-foot roller, tractors, truck and other equipment

Shovel cut in serpentine

# Interesting Features of Monterey County, California, Road

By Howard Lacy Walton, Assoc. M. Am. Soc. C. E.
*Field Office Engineer, Division of Highways*

THE east half of road contract No. 65 WC3, NRH 95-B, from Mustang Ridge to Priest Valley in Monterey Co., California, was let last summer, the completion date being set at January 15, 1935; and it is proposed to construct the west half, leading into Peachtree Valley, in 1935. This will provide a high-speed road with grades not prohibitive to heavy trucking and open up an area that has failed to develop because of isolation.

Construction of the east half, which has just been completed and is 3.31 miles long, includes the complete realignment and shortening by about ½ mile of the existing Mustang Grade in the Diablo Range, a dangerous county road which was very steep and crooked, with a 15-foot road bed, 135 short-radius curves (many of them 50 feet radius), in places too narrow for two cars to pass safely. The new road for the first two miles falls almost continuously on a 6 percent grade, the balance on easier grades; has minimum radius of 300 feet, minimum sight distance of 600 feet, and roadbed width of 24 feet with a crown of 0.4 foot. The work included grading the roadbed, surfacing for a width of 20 feet with dark red siliceous shale to give a compacted thickness of 0.35 foot, placing corrugated metal culverts and concrete cattle passes and constructing property fence.

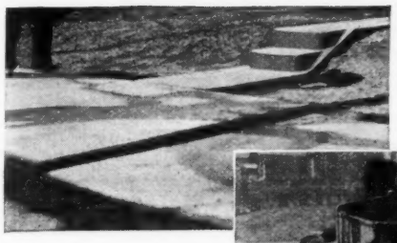
Points of special interest in the construction were: (1) The peculiar geology of the region presented unusual problems, resulting in a line change in one instance and benching of two of the high cuts in another. (2) Marked success of the "Carryall" and other grading equipment used. (3) No watering of fills or surfacing was required. (4) Benching method of removing slide hazard in high cuts. (5) The rounding or "baldheading" of crests of slopes in cuts.

(1). The crest of Mustang Ridge, which trends northwesterly, is the locus of the San Andreas fault zone. The fault is readily traced by ridges, sinks and undrained ponds which occur along the strike within a half-mile belt. One of these sinks, known locally as Priest Lake, is close to the beginning of the project. Crossing the line of the roadway are several well defined local faults. The formation northeast of the San Andreas fault traversed by the new road contains no granite and the oldest rocks are Franciscan, consisting of sandstone, chert and red siliceous shale into which have been intruded basic igneous rocks, which later changed to serpentine. The serpentine rocks are relatively soft, requiring very little powder work. The material, when even slightly moist, is very slippery. The linear shrinkage is about 6%.

(2). Except for one sandstone ridge, most of the heavy cuts (the maximum was 75 ft. deep) were in serpentine and practically all of the material could be removed by Carryalls following scarifying, and with very little shooting; only one car of powder having been used on the whole job. A 2-yard Northwest shovel and trucks were used for two hard rock cuts and for removing and placing the surfacing material. The other equipment used comprised two 12-yard Le Tourneau Carryalls, pulled by 80 horsepower Cletrac diesel engines; six 60 horsepower caterpillars (butane equipped) with bulldozer and scarifiers attached; two 12-ton, 3-wheel rollers; a Rome power grader, and an Austin leaning wheel grader.

Material was placed in 8-inch layers and rolled continuously with 12-ton rollers. At the initiation of fills, a sheepfoot tamper was used until sufficient area was available for the 3-wheel rollers.

# MUD-JACK METHOD



Sidewalk slab below grade

Pumping mud under slab

Slab raised to new grade

## Sidewalk Subgrade Reconstructed

This sidewalk slab was raised approximately 3½ inches to a new grade by the N. E. C. Mud-Jack in less than twenty minutes. New adjoining walk was laid at a higher level, making it necessary to correct grade of old walk. The Mud-Jack Method solves problems of this kind quickly and economically without the usual cost and time-consuming reconstruction activities.

*Write for Mud-Jack Bulletin*

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## "IN 40 YEARS FROM NOW IT SHOULD STILL BE A GOOD PAVEMENT"

Before the turn of the century, engineers were proudly viewing their completed brick pavements and confiding their belief that *here* was a pavement that would last.

Many of those pavements have long since exceeded the highest hopes of the engineers who built them, not only for length of life, but for lowest maintenance cost as well.

Today, the second and third generation of engineers are now relaying some of those 40-year old brick and saying—

"I shouldn't wonder if this pavement would last *another* 40 years or more."

Out of long experience, pavement builders and pavement users have learned that a brick pavement will outlast all others,—will cost *far* less per year of service.

Where you desire the minimum in pavement costs, use brick. Neither the weather nor the traffic will destroy it.

For recommendations on resurfacing various types of pavement with brick, write National Paving Brick Association (Affiliated with Structural Clay Products, Inc.) 1245 National Press Building, Washington, D. C.

# BRICK

**RESISTS WEATHER AS WELL AS TRAFFIC**


When you need special information—consult the *classified* READERS' SERVICE DEPT., pages 47-49

(3). The average annual rainfall for this region is only 18 inches, and temperatures range from 20 degrees above in winter to 110 degrees above in summer. Moisture content of the embankment material averaged 5%, and as no water was available for sprinkling, the fills (which reached a maximum depth of 80 ft.) were built up relatively dry. However, regular tests indicated high relative compaction, which was due to the peculiar nature of the material and the excellence of the rolling, together with the compaction obtained by the use of heavy miscellaneous equipment on the fills.

(4). Slopes of ½:1; ¾:1 and 1:1 were successfully brought down in all cuts; however, in the deep serpentine cuts it was found advisable to cut 20-foot benches half way up the slopes. This method of reducing slide hazard proved more efficient than increase of slope ratio and involved less expense.

(5). The crests of all cut slopes were rounded off or "bald headed" on about a 5-foot radius. This operation not only gave a better looking finish but delays maintenance work due to runoff not intercepted by the surface ditches.

The area traversed is primarily given over to cattle raising, necessitating construction of cattle passes, which were made as 6 x 7-foot concrete box culverts. Seven and a half miles of fence was constructed and portions of this included a hog wire mesh.

After the final center line had been run out by usual transit and level methods, all other work, including the setting of clearing stakes, slope catches, and cross sections for monthly estimates, were made by a 5-man party using a Rhodes Arc. In mountainous locations such as this, the Arc is indispensable.

The job was started July 6, 1934, by the contractor, the Peninsula Paving Co. of San Francisco. The average number of men employed by the contractor was between 50 and 60. Three 6-hour shifts were run until November, and then two 5-hour shifts were substituted. Kohler portable electric light plants were used during the night operations. All labor was limited to 30 hours per week and a wage scale considerably higher than the general prevailing rate of wages was paid by the contractor. Labor was obtained through the National Reemployment Service.

Special provisions of the contract called for the use of hand labor methods in as many of the operations as possible, with the idea of giving work to more men. Such work as sloping, construction of surface ditches, small culvert installations, fence construction and placing of guide posts, were completed by hand labor and with no loss to the contractor.

Some of the important contract items were as follows:

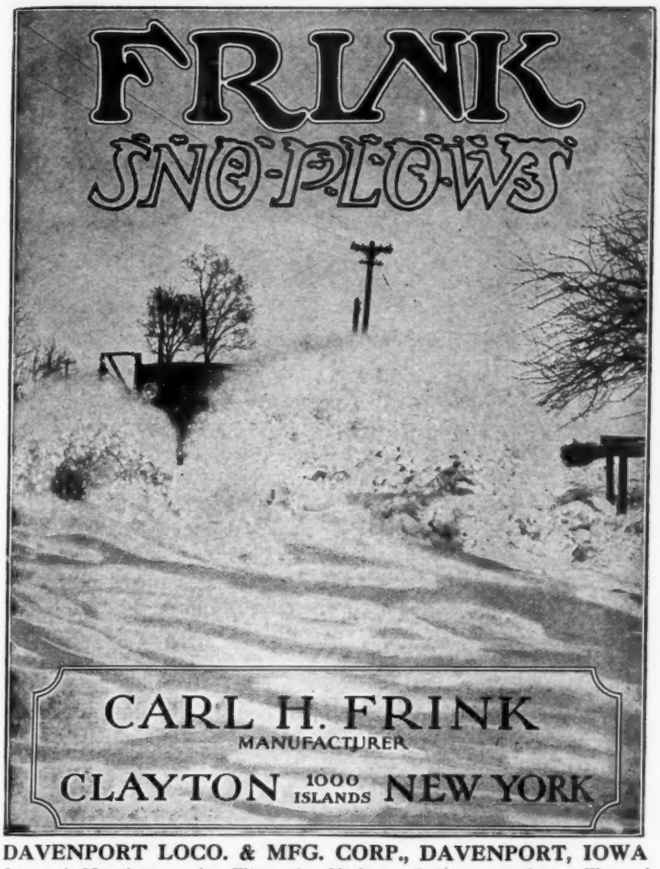
29.3 acres clearing and grubbing @ $150.00.
322,900 cu. yds. roadway excavation @ 21½c.
831,000 sta. yds. overhaul @ $0.012.
1,975 cu. yds. structure excavation @ $1.50.
5,500 cu. yds. of selected material for surfacing @ 40c.
10,200 mile-yds. haul on above @ 15c.
1,742 feet 18" culvert pipe @ $1.55.
832 feet 24" culvert pipe @ $2.55.
254 feet 36" culvert pipe @ $4.90.
184 feet 48" (8 ga.) culvert pipe @ $10.00.
240 feet 60" culvert pipe @ $13.00.
9 spillway assemblies @ $16.90.
325 timber guide posts @ $1.75.
7.3 miles of property fence @ $500.00.
12 fence gates @ $25.00.
60 concrete survey monuments @ $3.00.
120 yds. of structure concrete @ $30.00.
9,600 lbs. reinforcing steel @ $0.065.

In addition, 23,500 cu. yds. of roadway excavation was authorized for slide contingencies and 139,000 sta.-yds. overhaul for the above. Extra work orders and additional work orders increased the above totals slightly.

Joe Cooney was superintendent for the contractor and all equipment, purchases and maintenance was in charge of Miss Alice Beard, one of the owners of the company.

For the state, the construction was in charge of J. M. Hayden, resident on the job, and E. R. Green, construction engineer for District 5, Division of Highways, from the office of Lester H. Gibson, district engineer.

**Shovel benching in Serpentine at "Cape Horn." Above—Beginning a cut and fill. Portable electric light plant at right.**

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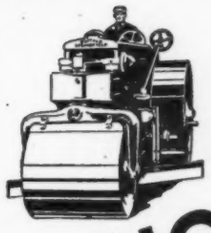
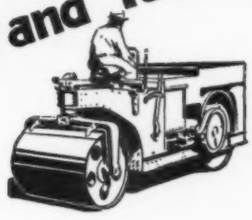


**BUFFALO-SPRINGFIELD**
**Three Wheel and Tandem**



**Buffalo-Springfield's complete range of models in both three-wheel and tandem rollers permits the purchaser to select the proper machines for his work.**

***Full details will be furnished on request.***

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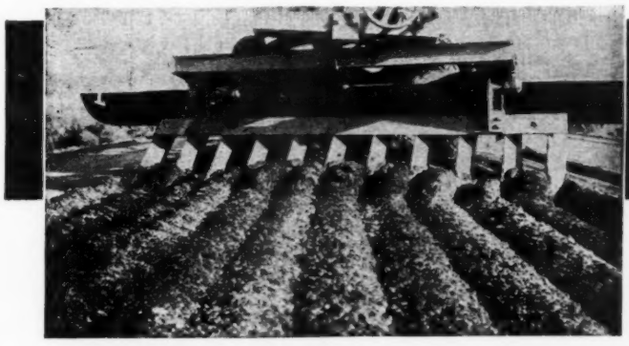
SPRINGFIELD, OHIO



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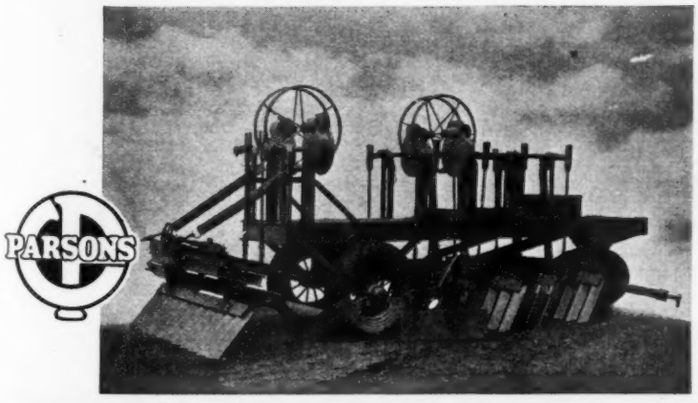



THREE-FOURTHS of the roads in United States are in the secondary or a lower class. These can only be improved by low expenditure methods. They can be best rendered dustless and mudless for all year service by the "mixed in place" bituminous treatment and the Parsons Turbo is the most efficient and economical "mixed in place" machine.

The Turbo has met the specifications of dozens of State and Federal projects. Better mixing at lower cost justifies its purchase for well managed projects.

**THE PARSONS COMPANY, INC.**
NEWTON IOWA

# Diesel Power Units Economical for Crushing Plants

Diesel power units are providing cheap power for numerous rock and gravel crushing plants, some of which have to be operated night and day, frequently in out-of-way places where fuel must be transported long distances.

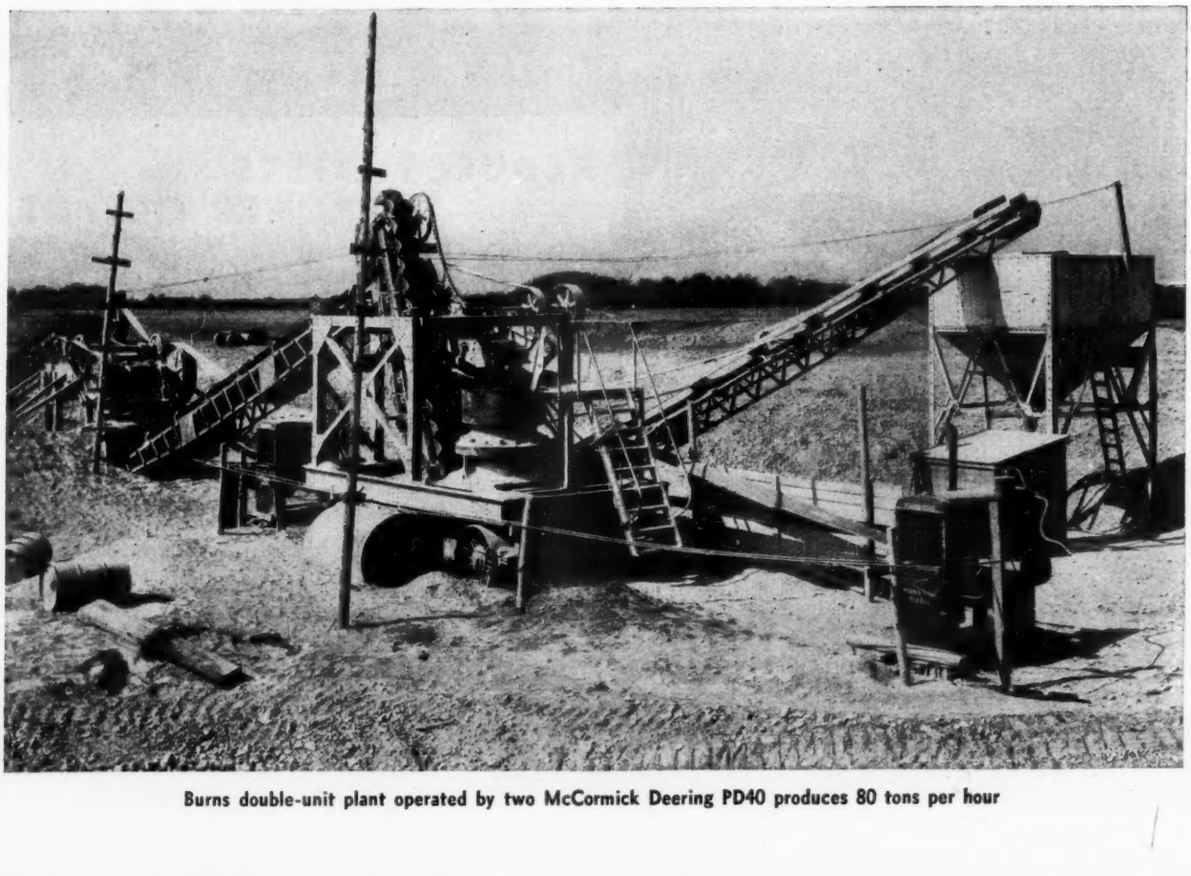
W. C. Burns, of Idaho Falls, Idaho, operated two portable crushing outfits last summer, using McCormick-Deering PD-40 Diesel power units. The complete double-unit outfit, which has a capacity of 80 tons per hour, is shown in accompanying illustration set up near Driggs, Idaho, located almost on the Wyoming-Idaho border and only a few miles from Yellowstone National Park. It was being used to provide material for a road-building job of 9.2 miles 28 feet wide between Victor and Driggs on the Sugar City, Idaho, to Jackson, Wyoming, highway, for which Mr. Burns had the contract. One of the crushers broke the material into sizes between 2 and 2½ inches and the other into sizes from very fine up to ⅞ inch.

The altitude at the installation is 8,000 feet. Mr. Burns had been using two 75 h.p. gas engines for the job, but the loss of power because of the high elevation was so considerable that he replaced these engines with the two Diesel units. These provided ample power to operate the two crushers and at a cost of about $1 per unit per day as against a previous cost of around $5 a day.

**Washington state highway crushing plant**

Saxton & Looney, road contractors, of Corvallis, Oregon, also operated a crushing and screening plant with a Diesel power unit (also a McCormick-Deering), replacing two kerosene tractors previously used. This outfit consisted of a 24-inch disk crusher and a 9x28 roller-bearing jaw crusher. Gravel was taken from the creek by a dragline hoist. The Diesel provided power for operating both these crushers and also the shaker screen, bucket elevator and centrifugal pump. The cost of operating the power unit per 10-hour day was a little over $1. From 18 to 22 gallons of fuel were consumed each day, with a production of 30 to 35 cubic yards of high-grade gravel per hour. Although this gravel crushing and screening plant was installed primarily to provide material for a state road-building job, the contractors are also selling gravel produced by it.

Another McCormick-Deering Diesel power unit, this one owned by the Washington State Highway Department, operates a 9x36 jaw crusher, a 24-inch disk crusher, two revolving screens, a bucket elevator and a conveyor. It is operated 20 hours a day, consuming 2½ gallons of fuel an hour, and produces some 20 yards of ¾-inch and minus gravel per hour.



**Burns double-unit plant operated by two McCormick Deering PD40 produces 80 tons per hour**

# One Man's Idea of Street Design—IV—Establishing Grades

By D. Y. Bate

THE writer, having started on railroad work, then into highway work before getting into municipal work, usually lays a preliminary center line grade in pencil. The old method of laying grades was to endeavor to balance the quantities of excavation with the embankment, if possible; but with the coming of high-speed traffic it is now the policy to lay long sweeping grades with long easy vertical curves connecting them, disregarding balance points if they interfere with this policy. On through traffic streets, allow for a sight distance of at least 800 ft. with the height of the driver's eyes 4 ft. above the pavement. Five ft. used to be the height considered for the driver's eyes, but with the newer designs in motor cars this has been changed to 4 ft. On concave vertical curves, it is a good idea to consider them the reverse of the convex curves and in that way the effect of the headlights will not be foreshortened at night and give the effect of driving into a solid wall.

In the suburbs, where it is possible to obtain additional right-of-way, endeavor to avoid sharp horizontal curves at top and bottom of grades; and where it is necessary to have a vertical curve on a horizontal curve, be sure to have the vertical curve extend beyond the limits of the horizontal curve. On vertical curves, have the change of grade between the various points of grade change no sharper than 0.4% in a 10 ft. chord. It is not good policy to make grade points on a vertical curve any closer than 20 ft., and the distance should be greater if possible. If the street is of a major traffic magnitude, 50 ft. is recommended as the length between grade points, but do not let the change in grade exceed 0.4% on high-speed traffic streets, and on minor traffic streets 1% should not be exceeded.

In laying the center line grade, intersecting streets should be considered. Get all available data on the existing surface—whether paved or unpaved, width and class of pavement if paved, amount of drainage carried, amount and class of traffic carried and the established, existing or proposed grade.

Never bench a main thoroughfare to take care of a steep grade on a secondary street, as this grade can be adjusted on the secondary street. Where two primary streets intersect, an adjustment that best fits all conditions must be made. Each such case should be considered separately and, if necessary, consult your district engineer for his opinion. Discuss the matter with him and most of them will welcome a statement of your views on the matter if presented in such a manner as to show that you have given the matter thought and not just brought it to him with the idea of letting him solve your problem. Very few intersection grade problems are such that they will not admit of more than one solution to them. With the height of crown and height of curb face determined, and a satisfactory center line grade laid, the curb grade should next be laid disregarding the beginnings of curb returns. In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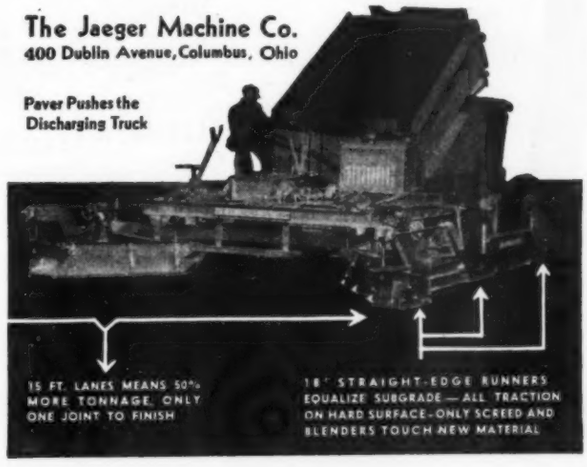
Paver Pushes the Discharging Truck
15 FT. LANES MEANS 50% MORE TONNAGE, ONLY ONE JOINT TO FINISH
18′ STRAIGHT-EDGE RUNNERS EQUALIZE SUBGRADE—ALL TRACTION ON HARD SURFACE-ONLY SCREED AND BLENDERS TOUCH NEW MATERIAL

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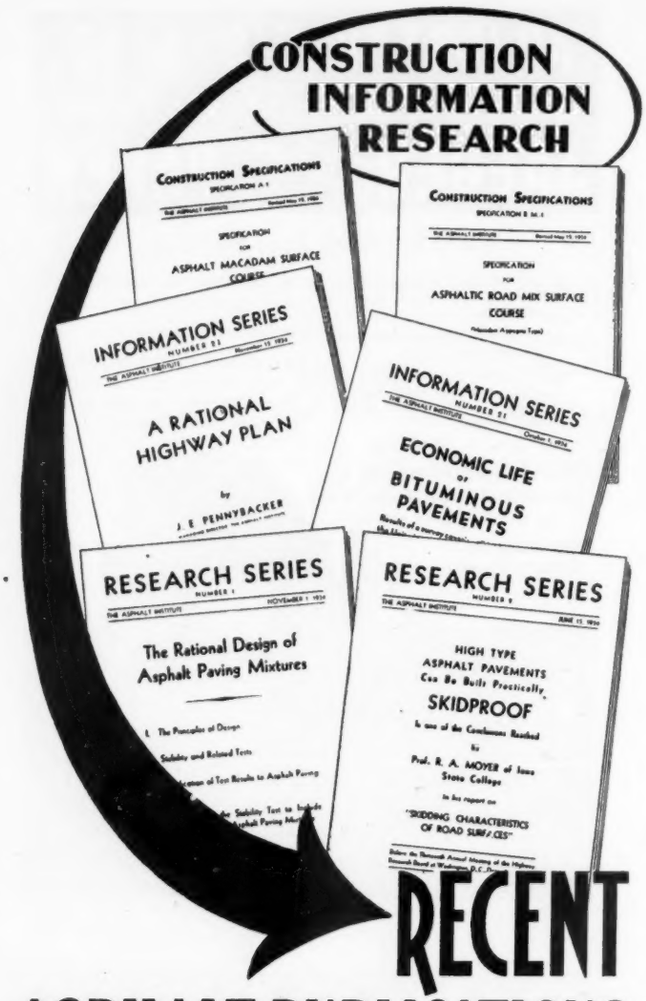
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laying the curb grade, due consideration must be given to any existing improvements and meet them in so far as possible. Where existing driveways are encountered, lay your grade so that you will have a 1-in. gutter at the driveway and in that way avoid a wet driveway due to any small amount of water in the gutter, such as results from the water running off when lawns are sprinkled.

Investigate the general slope of the surrounding ground and let the cross-slope of the street conform to it if possible, but remember that excessive cross-slope is very objectionable to drive on in dry weather, dangerous in wet weather and cuts down your waterway area for drainage purposes. Where garages adjoin the property lines, consideration of the ease of ingress and egress to them must be given. Some changes in the penciled center line may have to be made to meet existing conditions when the curb grades are laid. In meeting existing conditions, it is a good idea to "put the shoe on your own foot."

Having this much completed, next calculate the beginning of curb returns and ascertain their elevations so that when the circular length of the return is "stretched out" a smooth grade may be laid to connect the grades of the two streets. It is quite a help to the field men to split the lengths of these returns into an even number of parts when making grade points on them. An exceedingly high curb face at the intersections is not to be recommended except on account of adverse drainage conditions. It is not pleasant for ladies to have to step up high curbs in dry weather as well as in wet weather.

***Curvilinear Dedication***

In some communities when sub-divisions have been laid out in the hills, curvilinear streets have been resorted to, to take advantage of the terrain.

In the more recent subdivisions of this character, due to pressure from planning commissions and the coming of motor cars, better alignment has been obtained; but in the older subdivisions, especially those laid out as mountain cabin sites in the then rural districts, many intricate problems are encountered in an endeavor to obtain a feasible, economical, yet pleasing result.

In some cases, additional right-of-way must be obtained and the writer has encountered some subdivisions where a re-subdivision would have been advantageous, had it been possible to obtain the consent of all parties concerned.

On sidehill work, the policy of the writer is to endeavor to get the outside curb "on solid," i.e., endeavor to avoid having the curb on a fill. In some instances this is absolutely mandatory because the toe of the fill will fall within the roadway of the street below, which would be disastrous. In these circumstances a wall is the only solution, but as a general rule it is an unsightly solution, and the cost of walls is almost prohibitive and they usually hamper the full development of the property upon which they are erected.

*Constructing Fills.* If you must make a fill, be sure that all vegetation has been thoroughly cleaned from the areas upon which the fill material is to rest, and then thoroughly plow the area to insure a bond between the old material and the new fill. Terracing may also be resorted to and is recommended where the old material is on a rather steep slope. Father Time and Mother Nature are an eccentric pair and do things which oftentimes upset a lot of our theories. It has been the experience of the writer that any curb or pavement placed on a fill, especially where the original ground was on a steep

slope, will have a tendency to warp out of line and crack if placed much sooner than two years after placing of the fill.

Raising a fill in thin layers, wetting and rolling and finally flooding do a lot toward settlement of a newly laid fill, but Father Time and Mother Nature have to get in their work, too. It is a safe policy to allow extra width on fills to allow for the eventual rounding of the shoulder due to shrinkage and erosion. Where both curbs are placed "on solid," there is usually excess material in excavation with which to widen the shoulders of fills, also many undesirable drainage conditions may be eliminated and the contractor may save himself expensive hauls of excess material by getting permission from the property owner to dump this excess material in the gulches which every sidehill subdivision has.

*Alignment.* In the older subdivisions which were laid out rather haphazardly, either from lack of experience or otherwise, the designer should endeavor to work out a special alignment which will take advantage of all possible reduction in quantities, better the grade and correct, as much as possible, the original poor alignment, eliminating as many of the curves as possible and correcting as far as possible any excessively sharp curves that cannot be entirely eliminated.

A reduction of the requested width of roadway may have to be made in some instances to obtain a design that will be feasible to build from the standpoint of cost. The writer encountered one such job where a 20 ft. roadway with two 5 ft. walks were requested on a 30 ft. dedication. The slopes of the ground between the various streets were so steep that all the walks had to be put "on solid," and to follow the request would necessitate a design such as to make the cost entirely prohibitive. Next, a design and grade were laid out omitting the walk on the down-hill side; then, with both walks omitted; and it was finally decided that, to be able to get an alignment and grade that was possible to be built without the cost being confiscatory to the property, 16 ft. without walks would be the maximum width. This width was then worked into a special alignment, taking advantage of all possible features to better both the grade and alignment. (See "A Curvilinear Side-Hill Street Job," PUBLIC WORKS, May, 1932).

Curvilinear work is quite interesting, presenting many peculiar problems in alignment calculation which are rather confusing to the man used to working tangential streets with approximately right-angled intersections. We can usually pick up a handbook or text book with the solutions for the various mathematical problems in them, but the speedy application of these solutions will only come by experience. Often a combination of two or more of these formulas is necessary, used either in a series or in combination.

In calculating the alignment of curvilinear streets, especially where special alignment is to be used, a good plan is to co-ordinate the points of intersection of all tangents on the original center line of the dedication, also all street intersections; then it is much easier to make the final calculations from measured, scaled or assumed offsets from this center line.

Endeavor to avoid reverse curves; if possible, leave at least 20 ft. of tangent between; and never use a broken-backed curve. Do not attempt the use of spirals, as their use has been proven entirely unsatisfactory and the average driver will "spiral" if given sufficient width in which to do it.


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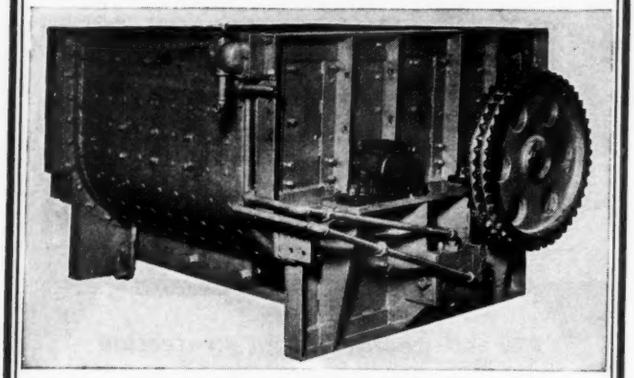

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For data on widening sharp curves see "How Wide on Curves," and for superelevation see "How Much Superelevation". In designing pavement on superelevated curves, theory requires no crown, but to avoid the appearance of a "dished section" a slight crown is advisable. Two inches crown in a 56 ft. street is sufficient, and this proportion should be observed for other widths. On very badly curved streets, especially with sharp curves and steep grades, superelevation should be used for the sake of safety as well as comfortable driving.

In designing gutters in curvilinear streets, arrange for the water which will be occasioned by wastage from lawn sprinkling to remain in its respective gutter. Where this is not done, water will run across the street at each reverse of superelevation and keep the street continually wet and cause the forming of slime and moss, making for an unsightly and very dangerous condition.

A few short-cut methods that the writer has found of use in this class of calculation are subjoined.

***Details on Plans***

In putting the details on the plan it is a splendid idea to give all ties ( i. e., distances along the center line and offsets therefrom) so that the field crews may work from the center line of the dedication direct and not have to figure from the property lines. In doing this, you are saving the time of the entire field party, as they can only move as fast as the chief of party can figure these necessary ties, while you have all the data before you in your office work and can do it much more speedily.

Wherever you show an elevation on the profile, drop down on the plan and show elevation for a complete cross-section on the plan. For the assistance of the field crew, make cross-sections on the plan at intervals of not to exceed 300 ft.

For intersection details, if they are very intricate, it is desirable to make a larger-scale sketch to one side, so that all the figures can be made perfectly legible.

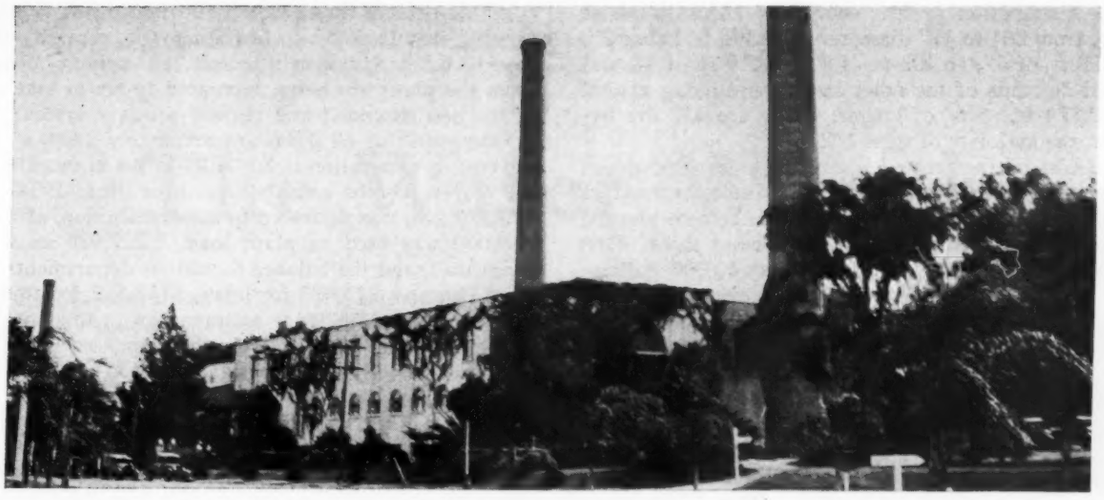
Make sufficient notes so that the plan can be used to construct from, without having to consult the original file to find out what class of pavement, its thickness, curb face, class of curb, the dimensions of the street dedication, pavement, walks and parking. Note any existing improvements to be met, joined or removed. Be specific as to trees to be removed or remain in place, and any special grading, flooding, variation in class of pavement and any special work to join existing pavements at intersections.

On the cross-sections up on the profile, draw in the proposed finished cross-section of the entire street width; also calculate your grades to the nearest 0.001 of a per cent. Mark respective profiles as to which side of the street they represent and make note on each grade line "Grade for top of curb,—side," "Grade for finished surface, Center line of Pavement," also mark the scale, both vertical and horizontal, in a prominent position in the title.

The above notes as to details on the plan apply alike to tangential as well as curvilinear streets.

---

The California Highway Department keeps ready for immediate service 155 snow plows, straight-blade plows for 2½ to 5-ton trucks, several V-type plows attached to 5-ton 4-wheel-drive trucks, and auger type and railroad-type rotaries with digger arms, as well as rotary widening units. Some 80,000 lineal feet of snow fence is in use.



Municipally Owned Power Plant at Orlando, Florida

# Water and Light Plant Owned by Orlando, Fla., Earns a Profit for Its Citizens

By M. W. Brown

*General Superintendent*

THE thirty-five thousand citizens of Orlando, Florida, are justifiably proud of their municipally owned and successfully operated light and water plants, bought in 1922 through a $1,500,000 bond issue, at a cost of $376,375 for the electric plant and $246,125 for the water plant (the Cheney water and light properties); the balance to be used to build a new plant and begin a reconstruction of the lines.

With the aim of keeping the utilities out of politics as much as possible, they are governed by a Utilities Commission of four, with the mayor serving ex-officio as a fifth, who serve without pay; the term of one expiring each year and his successor appointed by the Utilities Commission and approved by the City Commission.

The balance sheet on September 30th, 1934, showed these properties valued at $1,857,190 for the electric department, $1,364,376 for the water department, and $57,465 for general equipment; a total of $3,279,031—nearly $100 per capita. The current assets totaled $293,630, and the suspense accounts, $316,860. The liabilities, including investment by the city, customers' deposits, retirement reserve, etc., totaled $2,452,167, leaving a surplus of $1,437,355. Depreciation is figured in; the amount last year being calculated at $104,545.

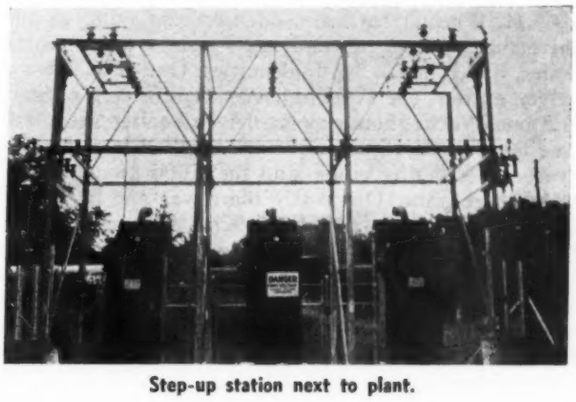
During the year ending June 1934 the water works revenue was $157,347; operating expenses $78,429; net operating revenue, $78,918; and the light plant revenue was $600,081; operating expenses, $185,910; net operating revenue, $414,171.

### *The Water Plant*

The original supply was taken from a small lake and passed through a 0.5 mgd slow sand filter. After purchase by the city a 4 mgd rapid sand filter was installed, on advice of Alvord, Burdick & Howson; and in 1926 another of the same capacity. The raw water is aerated, alum added (160 lb. per mg), then 80 lb. of lime as it enters the mixing basin; after passing through a settling basin it goes through the filters, there receiving chlorine (4 lb. per mg). It is then delivered to the distribution system by three 3 mg. Morris pumps and one 3 mg Allis Chalmers pump, at 75 lb. pressure at the plant, being raised into three elevated tanks in the N.W., S. and E. sections of the city.

The water reaching the consumers is believed to be the softest in the state—5 ppm. The treatment was inspected and approved in June 1934 by George D. Norcom. Daily tests are made by our chemist for hardness, alkalinity, color, odor, etc.; and bacteria tests three or four times a week.

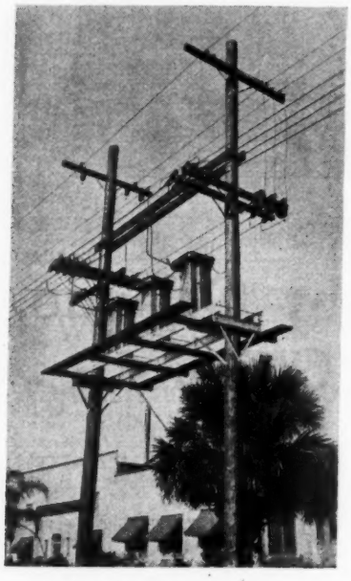
Lake Highland, the original source of supply, has been supplemented by Lakes Ivanhoe and Underhill; the later being the main supply. The first two lakes are within a block of the plant; Lake Underhill is on the outskirts of the city, and water is pumped from it to the plant by a 6 mg De Laval pump driven by a 250 hp synchronous motor. Three 3 mg Morris pumps driven by 25 hp motors, and an American Well Works 1 mg pump driven by a 25 hp motor pump water to the plant from the other two lakes.



Step-up station next to plant.

The distribution system comprises 162.2 miles of mains, from 20" to ¾" diameter; 483,391 ft. being 2", 237,599 ft. of 6", 36,403 ft. of 8", 21,119 ft. of 4", and smaller amounts of the other sizes, there being a total of 312,374 ft. of 6" or larger. There are 432 fire hydrants, the majority of them 6".

The cost of the treated water, including pumping, purification and maintenance, but without interest or depreciation, was 4.08 cts. It is sold to both residential and industrial consumers at the following rates: First 10,000 gallons, 25c per M. gal.; next 40,000 gallons, 30c per M. gal.; next 50,000 gallons, 15c per M. gal.; all over 100,000 gallons, 10c per M. gal.; minimum charge per month, $1.00.



Transformer Installation

The 7,774 active services are all metered; there are no flat rates except fire protection. Of the total revenue, $10,790 was from the city for fire protection, sanitation, etc., and $146,547 from private consumers. The total amount pumped averaged 2,324,000 gal. per day.

### *The Light Plant*

When the city bought the light plant in 1922 it comprised a 1,000 kw G. E. turbine-driven generator; a 750 kw G. E. generator driven by a cross-compound Skinner engine; and a 600 kw G. E. generator driven by a Skinner uniflow engine. The new water and light plant was designed by Alvord, Burdick & Howson. Only the 1,000 kw generator of the old plant was retained, and two new 1500 kw Westinghouse turbine-driven generators were added. The 1,000 kw G. E. unit has a Westinghouse jet condenser, and the two 1500 kw units have C. H. Wheeler motor-driven, circulating and condensate pumps, and Wheeler surface condensers. There is a 24-panel switchboard and seven circuits feeding from the plant. Steam was furnished by three 512 B.h.p. Springfield, 225 lbs. steam pressure boilers using fuel as oil.

In 1926, under the direction of Robert & Co., in order to take care of the increasing load there were added a 5,000 kw Westinghouse turbine-driven generator with a C. H. Wheeler surface condenser employing motor-driven circulating and condensate pumps; and a fourth boiler, 750 B.h.p. B & W oil burner. One G. E. steam-driven exciter, one Westinghouse steam-driven exciter, and one Westinghouse motor-driven exciter are used. The three smaller generators are handled by a ten-ton overhead traveling crane, and the 5,000 kw unit by a twenty-ton crane. Originally there was one feedwater heater, another was added in 1926; two reciprocating feedwater pumps which were replaced by two Allis Chalmers, and two Gould's turbine-driven pumps in 1926; four Worthington oil pumps, and a turbine-driven oil pump were added in 1926. A large stack 165 ft. high was added to the old one 125 ft. high, and the circuits were increased to ten.

At the present time a new 1,500 B.h.p. B & W boiler is being installed at a cost of $65,570 to replace one of the 512 B.h.p. Springfield boilers. The primary circuits from the plant are being increased to six to take care of the new extended and revised primary system.

One barrel of oil gives approximately 240 kw; and the cost of generation is 7.5 mills at the plant. During the fifteen months ending September 30th, 1934, 19,172,270 kwh was delivered to the distribution, of which 889,060 was used as plant load, 1,227,920 as water plant load, and the balance to various departments and loss. This cost $24,025 for labor, $113,522 for supplies and expenses, $7,329 for maintenance; a total production expense of $144,877. The other expenses were: Distribution, $39,864; utilization, $13,133; commercial, $21,394; new business, $8,010; general, $39,430. This gives a total cost of $266,748, or 1.39 cts. per kwh.

In Orlando, as is probably the case with most cities, the lines were extended to take care of the growth of the town without due regard to future conditions. A 2,400 volt, three-phase primary system, a 110-220 volt single-phase secondary lighting system, and a 220 volt three-phase power system are used to furnish current to Orlando's 7,076 customers. In 1933 the Commission again employed Robert & Co. to make a survey and draw plans for a revision of the lines and a systematized future extension.

In 1930 a substation had been installed, consisting of three 150 kw, two 200 kw transformers, an one 36 kva Westinghouse regulator, in the business district feeding that section underground from the plant with 10,380' of conduit. We decided to keep the distribution voltage at 2,400 volts, but to install a new unattended step-down substation on the site of the old substation and feed it with 12,000 volts from a new substation located beside the power house. Outdoor construction was used on the

*(Continued on page 38)*

Mr. L. B. Fort, Gen'l Mgr., Dr. E. H. Edwards, Pres. of Commission, and Mr. M. W. Brown, Gen'l Supt. examine new substation which takes care of increased load.

*Following is a digest of the important articles published last month having to do with water works design, construction and operation and water purification, arranged in easy reference form.*

# The Water Wheel

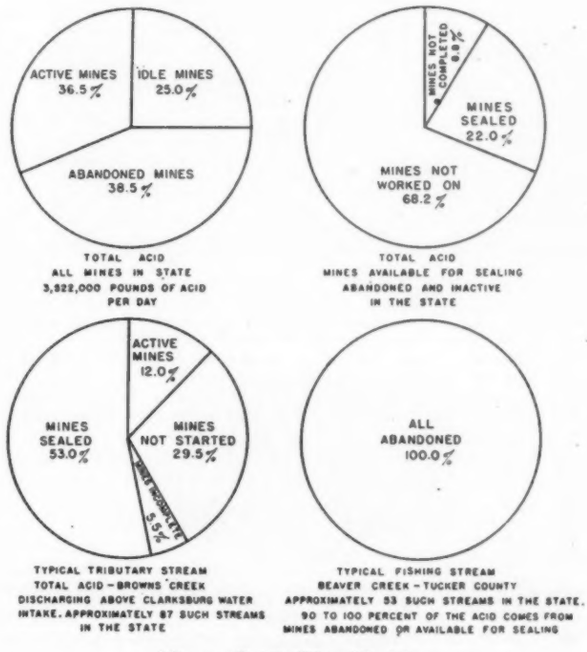
**WELL discharge** of 2,500,000 Imperial gallons per minute, obtained at Sault Ste. Marie last year, is believed to be the largest flow of any well in Canada. The well is 24″ for 72′ down to Lake Superior sandstone, and 20″ for 21′ in the rock. The static pressure at the surface of the ground is 8 lb. When pumping 1600 Imp. gal. for six days, the draw-down was 58 ft.; at 2500 gal. the draw-down was 90 ft. (72 ft. below the ground surface). It was estimated that 4 mgd. could be obtained with 11 ft. more draw-down. The water has 53 ppm. hardness.[M2-3]

**Mine sealing** on the Ohio river watershed was begun late in 1933 by the U. S. Public Health Service for the CWA, and when the latter ceased to function in 1934 was continued by the states. The tremendous work involved is indicated in that in Ohio alone there were about 25,000 openings to be sealed, and sealing cost $50 to $100 per opening. The necessity is indicated by the fact that 3½ million pounds of acid flowed into streams in West Virginia alone from active and abandoned mine openings; only 22% of which openings have been sealed. Already in the latter state there has been a noticeable drop in free acid content, cattle are drinking from streams and fish are found in them. Millions of dollars must yet be spent in the work but "it is known that the annual expense caused by the effects of the acid water is many times the total cost of the preventive program."[A2-19]

**The filtration plants** of Detroit, Mich., are the two largest rapid sand filtration plants in the world—the Water Works Park plant of 360 mgd maximum capacity and the Springwells plant of 300 mgd. The latter takes water from the lake through 11½ miles of tunnel 15.5 to 12 ft. diameter. The keynote of its design is practical simplicity—avoidance of complex designs costly to build or troublesome to operate. As a rule, where practicable, manual control was employed instead of automatic devices—differential chemical feed, automatic filter shut-off, etc. The filtered water reservoir has a capacity of 40 mg. Three mixing chambers give 15 min. mixing contact, the 4 settling basins give 2 hours retention, and the 68 filters have a rate of 180 mgd per acre, all maximum capacity. Rate of filter wash, 36 to 39 in. rise per minute. Operating head of filters, 9.5 ft. Filtering medium, 20 in. of sand, 95% pure silica, effective size 0.5 mm, uniformity coefficient 1.3; sand finer than 0.3 mm was washed out. Pipe galleries are heated by direct radiation, main building by recirculated air, controlled to a maximum average of 70° and average minimum of 50°; four changes of recirculated air per hour and one of fresh air; 6,846,900 Btu per hr. required at zero temperature. Loss of head from entrance of mixing chamber to effluent weir, 11.47 ft. Total cost of filtration plant $4,811,140, including $409,518 for engineering; including reservoir, building, etc., $6,610,632. This is equivalent to $3,292,791 adjusted to 1913 costs.[K12-1]

**Filter washing,** no matter what the rate, will not keep a bed in good condition if wholly applied from beneath the bed. Surface wash in conjunction with the conventional up-flow wash at reasonable rates appears to be a practical, economical method of keeping filter beds in good condition. Water under 10 to 15 pounds pressure applied through 3/16 to ¼ in. jet orifices located about 4 in. above the sand surface (when filter is not being washed) to give about 5 gal. of water per square foot per minute will be sufficient for most filters. Up-flow wash at the same time should be enough to give an expansion of 20 to 30% when the surface wash is shut off. The combination of both washes usually will require but 12 to 20 gal. per sq. ft. per minute.[G2-7]

**Pine Canyon Dam** (renamed Morris Dam) built by Pasadena, Calif., was planned with unusual care. Exploratory work at the site included 23 tunnels with a total length of 2760 ft.; seven shafts totaling 520 ft.; 11 diamond-core drill holes totaling 875 feet. Foundations near upstream face of dam were grouted through double line of grout holes in deep cut-off trench, staggered 5 ft. apart and 30 ft. deep, and 150 ft. grout holes at 20 ft. intervals. To provide against earthquakes and uplift, the volume of the dam was increased 15%. Over a fault (which has not moved for at least 10,000 years) 4 vertical sliding planes extend from top to bottom, with bituminous filler between faces, and 3 ft. open spaces from top to bottom permit 6 ft. horizontal motion in either direction. The spillway was designed for twice the maximum recorded flow. To permit future study of dam stresses, a large number of Carlson strain


ACTIVE MINES 36.5%
IDLE MINES 25.0%
ABANDONED MINES 38.5%
TOTAL ACID ALL MINES IN STATE 3,822,000 POUNDS OF ACID PER DAY
MINES NOT COMPLETED 9.8%
MINES SEALED 22.0%
MINES NOT WORKED ON 68.2%
TOTAL ACID MINES AVAILABLE FOR SEALING ABANDONED AND INACTIVE IN THE STATE
ACTIVE MINES 12.0%
MINES SEALED 53.0%
MINES NOT STARTED 29.5%
5.5%
TYPICAL TRIBUTARY STREAM TOTAL ACID – BROWNS CREEK DISCHARGING ABOVE CLARKSBURG WATER INTAKE. APPROXIMATELY 87 SUCH STREAMS IN THE STATE
ALL ABANDONED 100.0%
TYPICAL FISHING STREAM BEAVER CREEK – TUCKER COUNTY APPROXIMATELY 53 SUCH STREAMS IN THE STATE. 90 TO 100 PERCENT OF THE ACID COMES FROM MINES ABANDONED OR AVAILABLE FOR SEALING

Mine sealing in West Virginia.

gauges have been placed at 50 ft. and 100 ft. above bedrock. Glass tubes 5 ft. long with silvered interior were placed at various depths where cracks are likely to occur; the breaking of a tube and its silver lining will open an electric circuit.[E1-3]

**Underground dam,** intercepting ground water for municipal supply, was built by Harrisonburg, Va., in 1934. A reinforced concrete wall, 15 ft. or less high, was carried to the ground surface from bed rock—a tight sandstone—across the 900 ft. of valley of Dry river. A stone fill (of stone selected from the excavation) was placed up stream from this wall, and a collecting gallery was built near one end, from which a 14-inch cast iron main carried it to the main supply line. Twelve large underground streams and several minor flows were encountered in excavating for the wall. The water collected by this dam was measured as 594 gpm on July 19, 1934; 590 gpm on Aug. 27, and 1125 on Sept. 26. In addition, 500 to 700 gpm was contributed by a surface stream along one side of the valley.[E1-2]

**Reforestation of watersheds** was begun by North Adams, Mass., in 1921 and by the end of 1933 they had planted 340,000 evergreen trees and 7,000 locusts, the latter to provide fence posts. Wild currant and gooseberry bushes are removed each year from the vicinity of all white pine. White, red and Scotch pine are planted, and white and Norway spruce. The trees are furnished free by the State Dept. of Conservation, and planted by contract at a cost generally of $13 to $15 a thousand. Reforestation has been found to prevent soil erosion and turbid water, reduce silting of reservoirs, retard melting of snow in the spring and prolong the run-off from that source, check run-off in flood periods by storing in the soil part of the rain and melting snow. Replacement of deciduous trees and brush with evergreens tends to reduce the color of the water due to the smaller quantity of leaf carpet. A well kept, beautifully forested area produces a sense of pride in the citizens. [B11-2]

### *Bibliography of Recent Water Works Literature*

*To find an indicated reference, find the given letter and bold-face number at the left of the column, and the light-face number (following the dash) immediately below this. The bold-face number indicates the month of issue of Public Works in which the article was listed, which is generally the current but may be a previous one.*

*c*, Indicates construction article; *n*, note or short article; *t*, technical article.

**A 2** *Journal, Am. Water Works Association*
*December*

1. Changes in Federal Tax Laws Affecting Water Companies. By Louis D. Blum, pp. 1759-1768.
2. Taxation of Municipal Water Works. By A. C. Kamplain, pp. 1769-1772.
3. Work Incentives. By Hal F. Smith, pp. 1773-1782.
4. Mechanical Aids to Scientific Office Management. By W. P. Adams, pp. 1783-1786.
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6. Effect of Recent Drought on South Dakota Water Supplies. By E. G. Fiala, pp. 1446, 1449.

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4. Filter Plant Built with Profits from Municipal Light Plant. (Huntingburg, Ind.) By Chas. Brossman, pp. 38-39.
5. Comparative Bacterial Efficiencies of Anthracite and Sand Filters. By H. G. Turner, G. H. Young and R. R. Cleland, pp. 45-46, 54-55.

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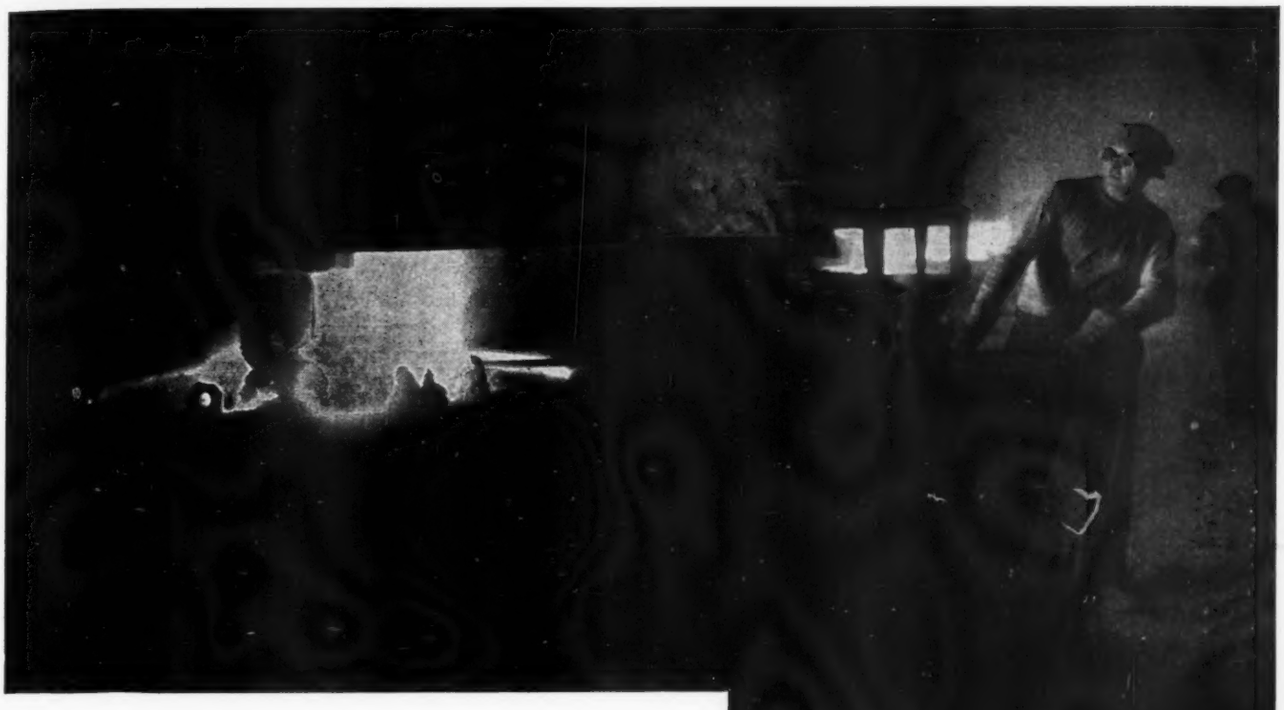

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When you need special information—consult the *classified* READERS' SERVICE DEPT., pages 47-49

# Activated Carbon in Richmond, Va., Filter Plant

Experience in the operation of the Richmond, Va., filter plant has convinced the engineer of the Bureau of Water, Marsden C. Smith, that, while prechlorination is useful in stabilizing the settled material in the coagulated water settling basins, yet "when basins are left too long in service, from either necessity or bad management, prechlorination is not effective in stabilization. Activated carbon will stabilize these materials over a greater range in time and putrescibility than will prechlorination."

When objectionable tastes or odors are present in the water applied to the filters "activated carbon is continuously applied just before the water passes on to the filters." Describing more in detail the conclusions from their experience, Mr. Smith said, in a paper before the Southeastern Section of the American Water Works Association: "Much experimental work has been done at this plant to determine the most effective use of this splendid material. While many may differ, we have found that within limits, when water is filtered through the carbon rather than the carbon mixed in the water, only about one-tenth as much is required for the same taste/odor removal. When carbon is continuously fed directly onto the filters it is inevitable that there will be a reduction in the filter runs. Hence for this reason alone there is practical limit to the quantity that may be thus applied, and if this quantity is insufficient for the purposes used, then the overdose must be applied ahead of coagulation to be settled out with the coagulant, thus prevented from reaching the filters.

"Recent tests prove that the most economical method of obtaining this filtering through the carbon is by coating the filter with the necessary quantity at the beginning of a run, adding more if required later in the run. The advantage of this is evident when it is considered that at a constant, continuous rate of feed of the carbon, if at the beginning of a run there is to be nearly enough, there must be vastly more carbon than necessary on the filter at the end of the run. At the time this is written the plant feed is being changed to permit this being done.

"There are no doubt factors other than the reduction of filter runs that may make it advisable to feed the carbon before or with the coagulant. Many of these factors have been suggested by Stuart and others in previous articles. Close study and accurate measurement of the results obtained in the use of activated carbon at Richmond have conclusively proven two definite facts, first, that the carbon feed should be so arranged that controlled quantities may be applied, either directly onto the filters or before or with the coagulant or both; second, that an accurate study of conditions at each plant and under different water conditions must be made to determine the most economical quantities and place of application."

## Lot Cleaning by Highway Department

During the early summer of 1934 the Highway Department of Upper Darby Township, Pennsylvania, was entrusted with the job of cleaning vacant lots of tall grass and weeds, which work had formerly been done by another department. The owners of lots where this neglected growth was a menace to public health were given five days' notice to clear them; if not cleared in that time, the department forces cut the grass and weeds and billed the owner with the labor costs plus ten percent. If the bill was not paid, a municipal lien was placed against the property.

To expedite the work, a Rawls Model 2M motor scythe was purchased. This machine has a 36 inch blade, and under proper conditions one man can do as much work with it as six men can do with hand scythes. Brush-hooks and scythes were used on the more stubborn growth. A total of 3122 man-hours was used on this work, which continued until the first heavy frost.

## Safe Construction of Ramps and Inclines

If ramps or inclines are made of wood, the joints should be carefully made and the planks thoroughly secured against uneven deflection, says the recently revised Safe Practices Pamphlet No. 59 of the National Safety Council, Chicago — "Warehouses and Shipping Rooms."

If cleats are provided to prevent persons from slipping the cleats should be placed about 14 inches apart and should extend from guard rail to guard rail at right angles to the line of travel: except where a runway is necessary for wheelbarrows and trucks, in which case the two outer planks of the runway should be equipped with cleats. In some places covered ramps or inclines used by pedestrians are surfaced with rubber carpet or a leather mat covering. Splinters, nails, patches, irregularities, breaks or cracks in walking surfaces are dangerous.

Ramps and inclines made with granalithic or cement walking surfaces are coming into general use. Anti-slip qualities should be obtained upon these walking surfaces by rough floating. Hardeners and trowelling never should be permitted. Another way to prevent slipping is by incorporating, for each square foot of floor surface, one and one-half pounds of abrasive grit, such as alundum, in the mix for finish coat, and then sprinkling another one and one-half pounds per square foot over the surface before giving the rough coat. Others prefer the use of a number of wide strips of anti-slip tread set ten inches on center in the cement and placed at right angles to the line of travel and flush with the surface of the ramp.

Inclines should be placed where it is not necessary to travel across them. Inclines or ramps used for wheelbarrow service should be built of an odd number of planks. This will afford an even passageway in the center for the wheels.

## Atlanta to Install Experimental Sewage Unit

Mayor James L. Key of Atlanta, Ga., has approved a council resolution authorizing the installation and operation of a 20-foot experimental sewage treatment tank equipped with the Laughlin Magnetite Filter Leaf. This mechanism has been operating for the past six months at the Chicago North Side Plant, demonstrating the values of this type of unit as compared to ordinary sedimentation.

The work at Atlanta is designed to determine factors for chemical treatment with this type of automatic filtration, and to reduce sprinkling filter loads. The work will be under the direct charge of Clark Donaldson, chief of construction, and William A. Hansell, assistant. Wiedeman and Singleton are consulting engineers for the city.

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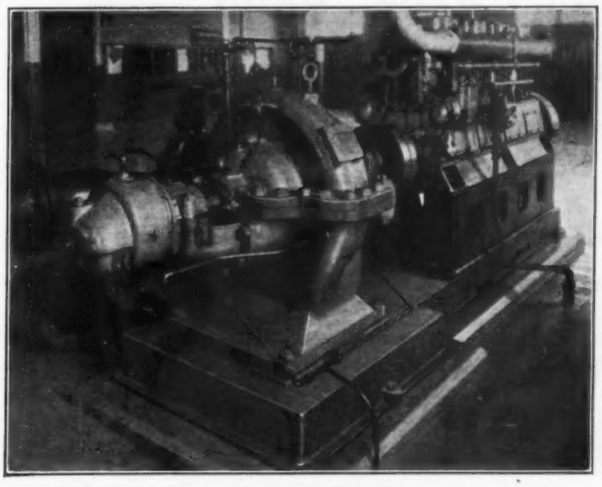

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## Water and Light Plant Owned by Orlando, Fla.

*(Continued from page 32)*

25x42′ of ground. Three single-phase 12,000/2,400 volt radiator-cooled conservator-type General Electric transformers connected delta-delta for a total of 2,500 kva; a three-phase step-type voltage regulator, Westinghouse, on the 12,000 volt supply; and six 400 amp. automatic-reclosing Westinghouse breakers on the 2,400 volt, 200 amp. feeders, with an additional space for two more switch positions and the 2,500 kva bank can be replaced with a 4,500 kva bank if it should become necessary. This substation, built mostly with CWA labor, cost $46,338.

When the substation was revised, the fair and recreation grounds of Orlando were fed underground by conduit installed by CWA labor, an extension of 3,200′ with eleven manholes and two vaults, at a cost of $12,-350. A three-phase, four-wire secondary lighting system was used here because of the load conditions. (This, incidentally, is the first and only place in which a three-phase lighting system is being used.)

Also, 4,050′ of 4-4″ conduit, with thirteen manholes, was laid from the plant to the north end of the city; and 4,950′ of 4-4″ conduit, with sixteen manholes, was extended from the present underground system south. This work was done by CWA labor and was installed for a future underground system. At the present time we are using 17,980′ of conduit and fifty manholes.

The second step, which is being done at the present time, is the revamping of the primary system to provide desirable voltage regulation and clear the system as much as possible from the trees by rerouting; and making provisions for a quick tie-in should one section go out in a storm, or because of other line trouble.

We have 7,076 active accounts as follows:

| | *Active* | *Inactive* |
|---|---|---|
| Residential | 5,208 | 1,506 |
| Commercial | 1,643 | 263 |
| Power | 221 | 31 |
| Comm. rfg. & cooking | 4 | 2 |
| | 7,076 | 1,802 |

We have reduced rates so that the current can be used for cooking and heating by the average family and have made a concentrated drive for range and heater loads. Our present rates are as follows:

RESIDENTIAL

| | |
|---|---|
| First 30 k.w.h. | 9c per k.w.h. |
| Next 50 k.w.h. | 6c per k.w.h. |
| All over 80 k.w.h. | 2c per k.w.h. |
| Minimum charge per month | $1.75 |

COMMERCIAL

| | |
|---|---|
| First 500 k.w.h. | 7c per k.w.h. |
| Next 500 k.w.h. | 5c per k.w.h. |
| Next 1000 k.w.h. | 4c per k.w.h. |
| Next 5500 k.w.h. | 3c per k.w.h. |
| All over 7500 k.w.h. | 2c per k.w.h. |

Minimum charge $1.00 per month per k.w. load.

GENERAL POWER

Under 100 h.p. connected load.

| | |
|---|---|
| First 500 k.w.h. | 6c per k.w.h. |
| Next 500 k.w.h. | 5c per k.w.h. |
| Next 500 k.w.h. | 4c per k.w.h. |
| All over 1500 k.w.h. | 2c per k.w.h. |

Minimum charge $1.00 per connected h.p. load. A 10% reduction is allowed on all these rates if the bill is paid within ten days of billing.

Our streets are lighted by 1,026 street lights, ranging in size from 100 cp to 400 cp; and 802 whiteway lights ranging from 250 cp to 600 cp, depending on the section of the city and the importance of the intersection or

*(Continued on page 44)*

*A Digest of the Sewerage Literature of the Month giving the main features of all the important articles published.*

# The Digestion Tank

**SLUDGE beds,** glass-covered and well operated, can accommodate 75 pounds per square foot per year of dry digested solids, when sludge with 8% solids is applied 10 in. deep about 16 times a year and the beds worked to capacity. Over-digesting sludge as well as underdigesting will slow up the drying process. Open sand beds with appurtenances have cost from 30 cts. to $1.00 per square foot; greenhouse coverings cost 85 cts. to $1.70 per square foot additional. The operating cost for removing sludge cake, including final disposal to dump, is usually between 40 and 60 cts. per cu. yd. Glazing and painting glassovers, inside and out, every three years should not exceed 3 cts. per sq. ft. per year; and other costs, such as sand renewal (estimated at 2″ a year), insurance on glass, and upkeep, would be covered by 4 cts. These figures would be less for a total area of greater than 14,000 sq. ft., and more for a smaller area. These figures would give a total annual cost, based on 20 years life, of between $8 and $9 per ton of dry solids, of which operation and maintenance would take about half.[C1-8]

**Vacuum filtration** of digested sludge is still in the experimental and demonstration stages. Tests made at Cleveland apparently justify conclusions that digested sludge can be conditioned with ferric chloride and be filtered; that the yield of filter cake increases with the percent of solids in the sludge, but is little affected by the percent of volatile matter between 45 and 53%; nor has amount of volatile matter any direct bearing on quantity of ferric chloride used for conditioning. The percent of ferric chloride used increased the yield up to a certain point (about 8% in these tests) after which there was apparently a decrease in yield with increase in dose. It also seemed to be shown that a sludge with moisture as low as 88 to 90% can be filtered without dilution other than that necessitated by the ferric chloride solution; that the best results with separate digested sludge are obtained when the pH of the filter feed is between 6.3 and 6.5; that if the moisture in the cake be over 75% it would not leave the filter cloth without smearing; that the filtrate is clear and inoffensive as to odor and the cake can be stored without giving offense. Estimate of cost of a plant to filter 10 tons of dry solids a day gave $250,000 (including only appurtenances essential to filtration); operation and maintenance, $19,000 annually; giving a total annual cost of $12.50 per ton of dry solids.[C1-8]

**Digesting activated sludge** alone involves difficulties, but proceeds under favorable conditions when 15% of primary-tank sludge is added. Digestion of equal-volume mixture of activated sludge and tank sludge can be carried on satisfactorily at 25° to 30° C., which temperature is preferable to thermophilic digestion at 50° to 55° for this type of sludge mixture. The digestion of activated sludge alone is unattractive, mainly on account of the low gas yield, and, from 25°-30° temperature, because of the difficulty of maintaining the optimum pH

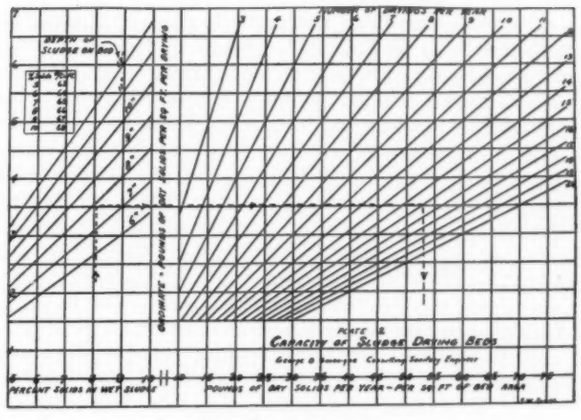
PLATE 2
CAPACITY OF SLUDGE DRYING BEDS
George O. Hamlin Consulting Sanitary Engineer
PERCENT SOLIDS IN WET SLUDGE
POUNDS OF DRY SOLIDS PER YEAR

**Capacity of sludge drying beds.**

of the digesting sludge. These are conclusions from a three-year program of research completed at the Davyhulme works of Manchester, England.[E1-3]

**Ventilation of treatment plant** is provided in the plant at Traverse City, Mich. The settling tanks, grit chambers, bar screen and chlorine dosing tank are contained in a large room; the sludge-drying beds are glass-covered. By means of a ventilating system, air can be drawn from these and discharged into a 75-foot chimney where it mixes with hot gases of combustion from boilers and incinerator, where sludge digestion gas is used for incineration; (also for heating the buildings and digestion tanks.).[C11-9]

**Lime is reclaimed** at the Winston-Salem sewage plant, where lime is added to screened sewage to an excess causticity of 50 ppm., followed by electrolysis, clarification, thickening of slurry, and dewatering sludge by vacuum filter. It was intended to incinerate the dewatered sludge, but it is odorless and so cheaply disposed of that this was never done, but it is removed at a profit to the city for use as a fertilizer.

It is planned to add 800 ppm. lime ahead of the bar screen, the calcium carbonate and solids being settled out in a clarifier. Carbon dioxide, obtained by calcining the sludge, is introduced into effluent after it has been electrolized, forming more calcium carbonate which is settled in a second clarifier. Preliminary figures show that the recalcined sludge will cost less than fresh lime, reducing the latter to 80 tons a year instead of 1,500 tons purchased now. Also the 5-day O D is reduced 95% by this treatment.[H1-2]

**Income from sludge** at Bradford, England, is increasing. The sludge from about 20 m. g. d. of sewage, totaling 262,742 tons for the year, was pressed into cake of 26% moisture, which was dried and powdered and sold to golf clubs, sports associations and public schools, large quantities were sold to farmers and to

fertilizer manufacturers; and recently a large consignment was exported, with more of this business promised in the future. Although the price has been increased, all of the following year's output had already been placed, nearly half for export.

Sulphuric acid is used as a precipitant and grease is recovered, for which there is a good demand both in England and abroad, and a much better price was obtained last year.[D1-8]

**Percolating filters** used as a preliminary to activated sludge treatment was seen in Germany by J. H. Garner —a very interesting reversal of generally accepted practice. "The advantages claimed were low air consumption, ease of operation because variations in flow and character of sewage were equalised through the filtration plant, and complete oxidation and a very low content of suspended solids in the effluent at all times. The system was being investigated in experimental plants at an important sewage works in England, where the sewage was very abnormal owing to a variety of trade wastes. The results should be both interesting and valuable."[D1-3]

**Population equivalents** of industrial wastes, based on 0.17 lb. of 5-day B. O. D. per capita per day, were determined in Indianapolis from observations varying from 1 to 4 days at the different plants. The following equivalents were obtained: Laundry, 23.8 per 100 lb. of dirty clothing; Creamery, 9.2 per 100 lb. of butter made; Dairy, 7.6 per 100 lb. of raw milk received; Canning, 54.5 per 1,000 lb. of pork and beans; Starch, 12.65 per bu. of corn; Meat packers, 42.3 per animal (70% hogs, 29% cattle, 1% sheep); equivalent to 28.6 per hog, in small establishment, or 19.4 per hog in large one; paper board, 107 per ton of product; garbage reduction plant, 336 per ton of garbage. The total equivalent of the major industries of that city was 267,728, while the population was 341,000. In 1929 the equivalent was estimated to be 773,000, or nearly 2.5 times the actual population.[C1-12]

**Sludge pumps** installed at the Harlem Valley State Hospital, Wingdale, N. Y. in 1934 comprised two raw sludge pumps, two excess sludge and three return sludge; the first two classes being 10-in. single acting, single cylinder plunger pumps, the stroke of which can be set at 3, 4 or 5 in., connected by reduction gear to motors, each of which has four speeds; the return sludge pumps being of the same type but having two 10-in. cylinders and their motors having two speeds. The four speeds have a relationship of 1, 1½, 2 and 3; thus giving 12 capacities with the highest five times the lowest for each pump, and double this range by operating both pumps at once. Novel features of the pumps are: Shearing pin protection against sudden severe overload; horizontal flap valves to allow free passage of heavy sludge and large solids; inside packing; circulating cylinder lubrication; walking-beam drive; enclosed gear reduction unit; and slow speed—only 40 strokes per minute, compared to 60 or more in usual installations.[C1-10]

**Concrete sewer construction** in trench in unsound rock in Washington, D. C. is facilitated by first setting a 12 ft. lining of ¼ in. steel plates and building 9.5 ft. sewer inside this, using steel inside forms. The same method was used in 2,840 ft. of tunnel. The outer steel lining facilitates construction and protects workers against rock falls. The sewer wall is 15" thick throughout in the tunnel, this thickness including a 4¼ in. brick lining in the bottom half, the bottom 120° of vitrified brick, with two 30° arcs of sewer brick. The same invert construction is continued in open cut, but the concrete arch is reduced to 12 in. at the crown. Voids between steel lining and tunnel rock are filled with grout at contractor's expense.[S2-1]

**Sand deposits** in the sewers of the Delmar-Elsmere Sewer District (near Albany, N. Y.) were removed in an unusual way. The sewer was laid in fine sand, much of which enters through leaky joints and breaks. Flushing only washed the sand further along the pipe. Finally, a portable catchbasin of wood 3 x 14 ft. by 18 in. deep was built, containing baffles at inlet and outlet end. In using, stop planks were put in the middle of a manhole, sewage pumped by a portable diaphragm pump from the up-stream side of this to the portable catchbasin, the overflow from which was returned to the manhole below the stop planks. The line above the manhole was "dragged" to bring the sand to the pump. The capacity of the pump was 20 to 25 gpm, and that of the catchbasin gave about 15 min. detention. The sand settling in the catchbasin was shoveled onto the ground for temporary storage and treated with chloride of lime. It was "surprisingly free from organic matter." During last summer 20 cu. yd. of sand were removed in this way.[G12-2]

### *Bibliography of Recent Sewerage Literature*

***To find an indicated reference, find the given letter and bold-face number at the left of the column, and the light-face number (following the dash) immediately below this. The bold-face number indicates the month of issue of Public Works in which the article was listed, which is generally the current but may be a previous one.***

*c*, Indicates construction article; *n*, note or short article; *t*, technical article.


**D**
**2** *The Surveyor*
*December 28*
1. Southport Main Drainage Scheme. By H. L. Bunting, pp. 647-648.
*January 4*
2. The One-Pipe System of (House) Drainage. By W. H. Scanlan, p. 13.
*January 11*
3. Design of a Complete Sewerage System (for Toronto), pp. 39-40.
4. Design of Sewerage and Outfall Works for a Small Town, p. 41.
5. German Sewerage Boards. By Dr. Imhoff, p. 42.

**G**
**2** *Water Works and Sewerage*
*December*
1. Sludge Dewatering at the Baltimore Sewage Works. By C. E. Keefer, pp. 403-
*January*
2. Meadville Sewage Treatment. By C. H. Young, pp. 9-11.
3. Practical Aspects of Storing and Handling Ferric Chloride. By J. M. Potter, pp. 12-15.

**H**
**2** *Municipal Sanitation*
*January*
1. Sewage Treatment in the Holy Land. By I. W. Mendelsohn, pp. 8-9, 20.
2. Treatment and Disposal of Sewage Sludge. By Paul J. Cerny, pp. 10-12.

**J**
**2** *American City*
*December*
1. Treating Highly Colored Textile Waste with Activated Sludge and Iron Salts, pp. 41-43.
2. Making Open Sludge Drying Beds More Effective. By F. W. Jones, pp. 62-63.
*January*
3. Drying Sludge on Vacuum Filters. By F. W. Jones, pp. 43-45.

**M**
**2** *Canadian Engineer*
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1. Tests at Waterloo and Kitchener Sewage Disposal Works, pp. 17-19.
2. Progress of Sanitation in Ontario, pp. 21-22.

**P**
**2** *Public Works*
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1. Needed: A National Policy on Stream Pollution, pp. 13-14.
2. Screens for Treating Cannery Wastes. By L. F. Warrick, p. 15.
3. Industrial Wastes Interfere with Imhoff Tank Operation, p. 18.
4. *n*. Disposal of Garbage via the Sewers, p. 19.
5. Engineering in Chemical Treatment of Sewage. By Geo. L. Robinson and C. F. Carrier, pp. 25-26.
6. *n*. Water Carriage and Incineration of Garbage, p. 32.
7. Vital Points in Sewage Works Management, p. 32.

**Q**
**2** *The U. S. Piper*
*December*
1. Super de Lavaud Pipe for Sewer Extension, pp. 55, 56, 70.
2. Cast Iron Pipe for Hamilton County Outfall Sewer at Cincinnati, pp. 68-70.

**S**
**2** *Construction Methods*
*December*
1. *c*. Steel Liner Plates and Steel Forms Aid Sewer Construction, pp. 44-45.

# Low Cost Bituminous Roads in Oklahoma*

By Chas. L. Wilson
*Oklahoma State Highway Engineer*

IN SOME parts of Oklahoma, roads have been constructed through blow sand stretches, many miles of which were impassable to traffic during dry weather. To provide a surface for these, it was the practice to apply a plating of clay. This presented a surface which was extremely slick or muddy in wet weather, and, since the sand was much too fine to make a satisfactory sand-clay surface, an application of gravel had to be made to make the road an all-weather road.

The cost of plating with clay and gravel, due to the inaccessibility of gravel, made the cost in some cases as high as $6,000 per mile. Numerous experiments in the use of different liquid asphalts were made on small stretches—sometimes not exceeding one hundred feet in length—in widely separated territories. By these experiments we determined that it was possible to use the roadside materials, or the material on the grade itself in combination with asphalt.

The first real project was constructed south of Sayre on U. S. Highway 283, in 1932. For the first applications of asphalt, the distributor was dragged through with a 60-Caterpillar tractor; then the surface was harrowed and disked until sufficient asphalt had been placed to stabilize the grade so it would support the distributor. Then additional oil was shot and the surface mixed by motor patrols moving the material from side to side until thoroughly mixed. This required some 2 to 3½ gallons of asphalt per square yard, depending upon the material of which the grade had been built. This construction was completed at a cost of (in round numbers) $1,500 per mile. With additional treatments, which have not exceeded $150 per mile per year, this grade has been kept in a stable and dustless condition.

A more striking experiment of this class of work is in Grant County, U. S. Highway 60, on a stretch of 4.4 miles east of Pond Creek. This road was constructed during a dry period and there was not sufficient moisture binding the material to support even the lightest motor traffic and it was passable to horse-drawn vehicles with difficulty. The soil throughout the section was a variable mixture of sandy loam and blow sand.

The procedure on this stretch was similar to that used at Sayre. A 65-hp. tractor was used to pull the distributor through and the surface was shot in two ten-foot strips, followed by disks and tooth harrowers, to stabilize the grade. After the grade had become more or less stabilized, the disks and harrowers were followed by a 15 or 20-hp. tractor pulling eight-foot blades to mix the material more. When the grade would support the distributor and motor patrols, approximately 500 cubic yards per mile of the material was moved to one side and allowed to cure. A base course was then obtained by repeating the operation previously described. The top material was then spread to a ten-foot width and asphalt applied to bring the bitumen content to approximately 5.5% by weight, the mixing process being the same as for mat construction. This was then smoothed out and spread over the 22-foot width in three operations or three layers, in order to allow traffic to compact the same. After the last distribution of surface material, the entire section was shaped with a 12-foot grader to insure a smooth surface and uniform crown. With the exception of the asphalt, no materials were used other than those which were present in the grade itself.

This construction cost $10,885.80, or $2,474.04 per mile. Asphalt was used at the average rate of 2.6 gallons per square yard. The cost includes cost of labor, materials and rental charge on equipment as well as the cost of reshaping and replacing the original grade. The resulting surface is smooth, dustless and, while maintenance costs of any value are not yet available, we believe this road will render satisfactory service at reasonably economical maintenance costs.

State Highway 19 and State Highway 48, which run through a newly discovered oil field, had been previously graded, drained and treated with maintenance gravel surfacing 2 inches thick. Due to the amount and kind of traffic, the wear on these roads was very rapid. As it was also very desirable that they be dustless, it was decided to surface them with asphalt mats.

The grade on State Highway 48 was constructed on a heavy, black gumbo soil, which provided a fair base. Gravel was hauled 9.2 miles and distributed along this section at the rate of 400 cubic yards per mile. Usual measurements and screen analyses were taken every 200 feet along the road to obtain the approximate amount of oil needed. The surface of the roadbed was first bladed to eliminate irregularities, the blading being as light as possible so as to disturb as little of the set-up gravel on the road as possible. After this, the road was primed with No. 2 Prime Oil at the rate of .3 gallon per square yard. The windrowed material was then treated with asphalt in the usual manner by spreading to a 10-foot width and mixing to uniform color, using a total of .85 gallon per square yard. This mix was then spread to a uniform width of 20 feet and allowed to compact under traffic.

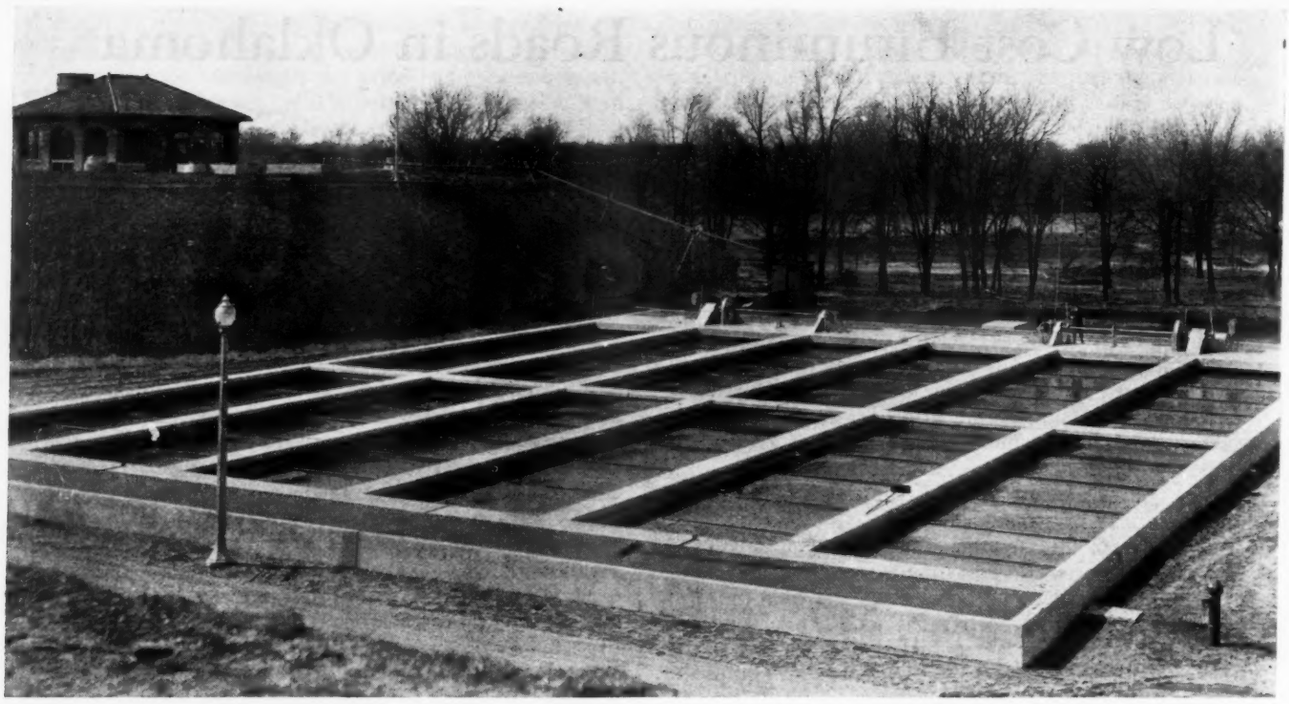
The cost record on the 9.2 miles showed a total of $1,514.82 per mile, and tests showed asphalt of 7.9% by weight, the average thickness of the mat being 1¼ inches.

State Highway 19 was laid in two sections—12.0 and 14.6 miles respectively—with approximately the same operations, except it was necessary to open ditches and do considerable reshaping, which added to the cost. The 12-mile section was completed at a cost of $1,442.98 per mile, and the mat showed 7.1% asphalt by weight and an average thickness of 1½ inches. On the 14.6-mile section, due to the long haul on gravel, the cost was $2,327.56 per mile, with 7.2% asphalt by weight and an average thickness of 1¾ inches.

The traffic count on State Highway 48 in January, 1934, shows a total of 3,000 vehicles per day, of which 30 per cent were heavy oil field trucks. On State Highway 19 the count shows 1500 vehicles per day with 10 per cent heavy trucks.

From our experience in other sections, we believe that these mats can be maintained at a cost of from $300 to $500 per mile, which is less than the amount that would be required to make replacements of gravel to maintain them in good condition as a gravel road.

*Abstract of a paper before the Indiana Road School



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## Water and Light Plant Owned by Orlando, Fla.

*(Continued from page 38)*

street. The six street lighting circuits are fed by two 68 kw, 6.6 amp. Westinghouse constant current regulators, and one 34 kva, 6.5 amp. Westinghouse regulator which is used for emergency purposes. The twelve whiteway circuits are fed by two 68 kw, 6.6 amp. Westinghouse constant current regulators at the plant; and three 25 kva, two 15 kva, one 7½ kva, and three 5 kva regulators controlled by the arc circuits.

The city is billed for current at the following rates:

| | |
|---|---|
| Lights & power | same as above schedule |
| 100 c.p. street lights | $17.50 per year |
| 250 c.p. street lights | 27.50 per year |
| 400 c.p. street lights | 40.00 per year |
| 250 c.p. whiteway lights | 42.00 per year |
| 400 c.p. whiteway lights | 50.00 per year |
| 600 c.p. whiteway lights | 58.00 per year |
| Fire hydrants | 25.00 per year |

For the year ending July, 1934, the revenue was $538,639.75 from private consumers and $61,441.29 from the city. The operating expenses were $185,909.91. Interest amounted to $82,500, and $104,545 was charged to depreciation.

Since the utilities were purchased they have not failed once to make enough profit not only to make every interest and principal payment and turn a substantial amount over to the city each year, but also to increase the property account of the plants to $3,789,000. Our rates are far cheaper than any of the privately owned companies in Florida. It is little wonder that our citizens are more than satisfied with their municipal ownership, and frequently refer to the utilities as their "gold mine."

# Engineering Societies

## ASCE and NYSSWA

The 82nd annual convention of the American Society of Civil Egineers was held in New York January 16-19, but the Sanitary Engineering section cooperated with the New York State Sewage Works Association in the 17th annual meeting of the latter on January 15.

A. E. Stilson was awarded the Kenneth Allen Memorial by the N. Y. S. W. W. A. at the luncheon at the McAlpin. E. B. Besselievre presided at this luncheon, and Prof. Charles Gilman Hyde reviewed the problems and trends of sewage treatment. Papers presented during the day included one covering the operational results of the Shades Valley, Birmingham, plant, by Harry Hendon; one on sewage plant laboratories by Wellington Donaldson; one on centrifugal dewatering of sludge by J. S. Pecker; the description of a colorimetric method for dissolved oxygen by Dr. M. L. Isaacs; and a resume of the Plainfield-North Plainfield-Dunellen plant by John Downes. This latter served as a guide for the inspection trip on Wednesday. Walter D. Binger, deputy commissioner of the New York City Department of Sanitation was the speaker at the annual dinner Tuesday evening. Morris Cohn, well known superintendent of the Schenectady Works, was elected president to succeed Mr. Besselievre.

The A.S.C.E. meetings began Wednesday with the annual business sessions, and in the afternoon there were meetings of the surveying and mapping, construction, highway and waterways divisions. Thursday also was given over to technical meetings for the men and for entertainment for the ladies. An excursion to the Roebling plants at Trenton and at Roebling occupied all day Friday.

## American Road Builders' Association

The ARBA meeting and Road Show was held at the Willard Hotel, Washington, D. C., Jan. 22-25. Exhibits were shown in the two ballrooms on the tenth floor, and these, the technical, and the social meetings were very well attended. No heavy machinery was shown at the exhibit booths, but interesting models were numerous, as were "movies" of construction pictures which were both interesting and instructive in regard to new developments.

The technical sessions were divided among the contractors, city officials, county officials and those of general interest, the latter covering generally recent developments in construction and design, conservation of highway funds, traffic control and legislation.

The contractors' sessions were almost entirely devoted to the topics of major interest today among contractors, including codes, hours and wages and selection of labor.

The entire program was well arranged and the convention one of the most successful of recent years.

## AWWA-Florida Section

The ninth annual meeting of this section will be held in conjunction with the fourth University of Florida Short Course in Water Treatment, from March 27 to 30, at West Palm Beach, Fla. Prof. A. P. Black, University of Florida, Gainesville, is chairman of the short course.

## Indiana Engineering Society

The Indiana Engineering Society, the Indianapolis-Lafayette Branch of the AIEE, the Indiana Section ASCE and the Indiana Branch ASME will hold a joint meeting at the Lincoln Hotel, Indianapolis, Ind., February 19. W. C. Mabee, Indianapolis Water Co., is president of the Indiana Engineering Society, and can supply a program of the meeting.

## Allis-Chalmers Exhibit and "Open House."

Exhibiting equipment ranging from the hydraulic turbines for Boulder Dam, down through steam turbines weighing 680 tons, flour mills, farm tools and road building machinery, to a tex-rope drive weighing less than a pound, Allis-Chalmers Mfg. Co. held open house to 30,000 at their Milwaukee plants.

Among the exhibits of especial interest were the largest boring mill in America, handling parts up to 40 feet in diameter and 16 feet high; castings up to 120 tons weight and cranes for handling these; saw mills to cut logs up to 72-inch diameter, and many other items. Crushers to take pieces of rock up to 25 tons weight, and able to crush at the rate of 1000 tons an hour were shown.

The A-C line of road machinery was paraded under power in front of the plant.

An unique exhibit was the 2,000,000-volt surge generator to produce man-made lightning, which is used in "finger printing" this enemy of public utilities.

# Personal Items

R. W. Wilder has been appointed city engineer of Elkhart, Indiana, succeeding Edwin M. Brady, who has been with the city since 1921.

Clarence W. Klassen has been appointed acting chief sanitary engineer of the Illinois Department of Public Health.

Stuart K. Knox, formerly a co-partner in the firm of Nicholas S. Hill, Jr., has retired from that association to enter private practice in hydraulic and sanitary engineers. Mr. Knox, who is a member of the American Society of Civil Engineers, will have offices at 25 Warfield St., Montclair, N. J., and 11 Broadway, N. Y.

Edmund B. Besselievre, manager of the Eastern territory of the Sanitary Engineering Division of The Dorr Company, Inc., New York City, sailed on Saturday, Jan. 26th, on the steamship "Southern Prince," for a year's visit to South America, during which he will visit practically all of the South American countries.

Harry F. Ferguson, chief sanitary engineer of the Illinois State Department of Public Health, died Jan. 16. Long a leader in public health engineering, Mr. Ferguson was widely known throughout the profession. He joined the engineering staff of the Illinois State Water Survey in 1912 and three years later the State Department of Health. He served in the Engineer Corps during the war, returning to his former job at the close. In 1921 he was appointed chief sanitary engineer, which position he held until his death.

# Book Review

## Elements of Water Supply Engineering

By Earle L. Waterman. 301 pages; 72 illustrations. Published by John Wiley & Sons, Inc.; price $3.50.

The author states, in his preface, that this text is designed to cover the fundamentals of water supply engineering. It does so, and in very good fashion. It is fairly brief, clear, well-arranged and to the point. We think it the best book we have seen for some time for the college student or for the man who wishes to have a text that treats principally of the fundamentals of the subject.

The chapter headings include: General requirements as to quantity and quality; bacteriological, physical, chemical and microscopical examinations; sources of supply; precipitation; ground waters and their collection; stream flow; impounding reservoirs; intakes; transportation of water; and pumps and pumping plants. These total 189 pages. Treatment of water, including filtration, chlorination, aeration, softening, etc., is covered in 47 pages. There then follow four chapters on distribution and distribution systems, operation and maintenance, and finance.

One criticism of this text is that the references, which are fairly numerous throughout, are limited to practically two association journals and one engineering magazine. Moreover, many of them go very far back into what is now almost ancient history in water works technique, so far has the art advanced in the past 10 years. We recommend that the author read the WATER WHEEL more closely and note how many really excellent articles are appearing in at least three other magazines which he has scarcely mentioned at all. This same criticism may be applied to some other recent authors, as well.

## Griffin Well-Point System:

Not only are these Griffin well-points of value in handling construction problems where unusual quantities of water are present, but they also can be used most advantageously for collecting ground water for water supply. This double use is possible because of the unusual construction of these well-points, which provides a water flow between drainage channels. The streamline construction helps in removing points after use, without loss. The jet drive arrangement allows sinking these points in soils which are ordinarily impenetrable by ordinary jetting methods. Fuller information can be obtained from the Griffin Wellpoint Corp., 60 East 42nd St., N.Y.

Griffin Well Point

## "Nitramon"—For the Blaster:

A new blasting material has been announced by the Explosives Department of the du Pont Company. This new product cannot be detonated by the strongest commercial blasting cap, by impact, by flame, nor by shooting a rifle bullet into it. In actual use it is exploded by means of a large diameter cartridge of dynamite. It is non-headache producing and is rendered absolutely water resistant by being sealed up tightly in a tin can. It is stated to represent the ultimate in safety in so far as a blasting agent is concerned. It is non-freezing. It will be known as "Nitramon."

The new product will be marketed only in large diameters, for example, four inch, four and one-half inch, five inch and seven inch.

## A Power Wrench:

This is a small pneumatic machine weighing about twenty pounds that will spin down a 1-inch or larger nut at 700 rpm. and then give it a series of smart torsional blows at the rate of 1,400 a minute to tighten it as securely as desired. This type of turning action, new to a power wrench, makes it possible also to remove nuts which could not be taken off except by splitting with a chisel or burning with a torch.

For additional information concerning this impact wrench, address Ingersoll-Rand Company, 11 Broadway, New York City, and ask for descriptive pamphlet No. 2152.

## Concrete Vibration:

An interesting and complete folder on concrete vibration, covering benefits of vibration, proper procedure, results, data, and prices. Munsell Conc. Vibrators, 999 West Side Ave., Jersey City, N. J.

## Quiet Electric Motors:

Westinghouse has designed quiet motors for schools, hospitals, churches, libraries and other places where noise is objectionable. Folder on request describes them. Write the Editor, or Westinghouse, Pittsburgh, Pa.

## Pipe in Water Purification:

A 4-page folder issued by International Filter Co., Chicago, Ill., on the use of Transite pipe in water purification plants. A table gives complete dimension data on sizes 2-inch to 36-inch. Sent on request.

## "X" Marks the Spot:

A four-page bulletin stresses the use of calcium chloride in skidproofing icy streets. Solvay Sales Corp., 61 Broadway, N. Y.

## Cast Iron Main Service Records:

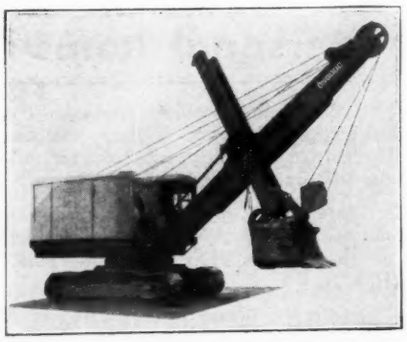
A beautifully prepared booklet giving data on service records and life of cast iron mains in many cities. Sent on request to Cast Iron Pipe Research Association, 122 So. Michigan Ave., Chicago, Ill.

## Nuchar Odor Detector:

This is a carefully built and unusually handy piece of apparatus for detecting odors in water. It was illustrated on page 3 of the January issue of PUBLIC WORKS. Very gentle inhaling produces results. One of these detectors will be sent on request to Fred Stuart of the Industrial Chemical Sales Co., 230 Park Ave., N. Y.

## New Osgood Power Excavator:

The Osgood Company, Marion, Ohio, announces a new 1¾ cubic yard size power excavator, the "Chief." This is designed for use as a shovel, dragline, clamshell, or crane; it is readily converted in the field from one class of service to the other. As a shovel, it can be furnished with either the wire rope crowd of the positive type, or with the new independent chain crowd. In either case, the boom angle can be changed to suit the working conditions without adjustment of any kind other than the necessary raising or lowering of the boom by the power boom hoist.



**The new Osgood "Chief" is of 1¾ yard capacity.**

## Illinois Bituminous Distributor Contractors:

In sessions at the Drake Hotel in Chicago, December 3 and 4, 1934, held concurrently with meetings of the National Bituminous Association, Illinois operators of bituminous distributing apparatus listened to a discussion and explanation by a Deputy Administrator of the Code governing their industry, which became effective November 26, 1934, and elected administrative officers for the ensuing year, as follows:

President, Finis P. Ernest of East St. Louis; Vice-Pres., Geo. Kreiner of Rockford; Secy.-Treas., G. J. Berkley of Chicago. Directors: Earl Walker of Sullivan, Louis Marsch of Morrisonville, J. F. Powers of Bloomington, Thomas DeBrun of Assumption, R. H. Davidsmeyer of Jacksonville, S. A. Love of Chicago, Finis P. Ernest, Geo. Kreiner and G. J. Berkley. Code enforcement committees: For Northern Illinois, A. F. Schupp of Joliet, Geo. Kreiner of Rockford and B. J. Deming of Chicago. For downstate Illinois, Earl Walker of Sullivan, J. F. Powers of Bloomington and R. H. Davidsmeyer of Jacksonville.

The Promotion and Specifications Committee, Truman L. Flatt of Springfield, B. J. Deming and L. L. Pelling of Chicago, will meet with engineers of bituminous material companies and with highway officials and engineers, to compile a broadened series of standardized specifications for resurfacing roads and streets; also to work out a plan for coordinated promotion of black top construction.

Office of the Secretary of the association, G. J. Berkley, is at 5915 Rogers Avenue, Chicago.

# Material Prices

*(Published for information only)*

(Jan. 23, 1935)

***Warehouse Prices on Reinforcing Steel and Structural Shapes***

| | *Structural Shapes* | *New Billet Reinforcing Bars* |
|---|---|---|
| New York | 3.37c | 2.82 |
| Boston | 3.52 | — |
| St. Louis | 3.44 | — |
| Cincinnati | 3.40 | 3.25 |
| Pittsburgh | 3.15 | 2.90 |
| Chicago | 3.20 | — |
| Philadelphia | 2.95 | 2.955 |
| Cleveland | 3.31 | 2.60 |
| San Francisco | 3.55 | 3.50 |

***Prices on cast iron pipe, net per ton, Class B, 6-inch and larger, AWWA specifications****

| | | | |
|---|---|---|---|
| Boston | $47.50 | Baltimore | $45.50 |
| New York | 44.90 | Atlanta | 42.00 |
| Chicago | 46.00 | Birmingham | 38.00 |
| Minneapolis | 48.50 | Kansas City | 48.15 |

Burlington, N. J., $42.00; extra price for 4-inch, $3.00 per ton; extra for Class A, $3.00 per ton

**Information, courtesy U. S. Pipe & Foundry Co.*

***Warehouse Prices on American Pig Lead***

Per pound

| | |
|---|---|
| New York | 4.50 to 5.50 |
| Cleveland | 4.70 to 4.95 |